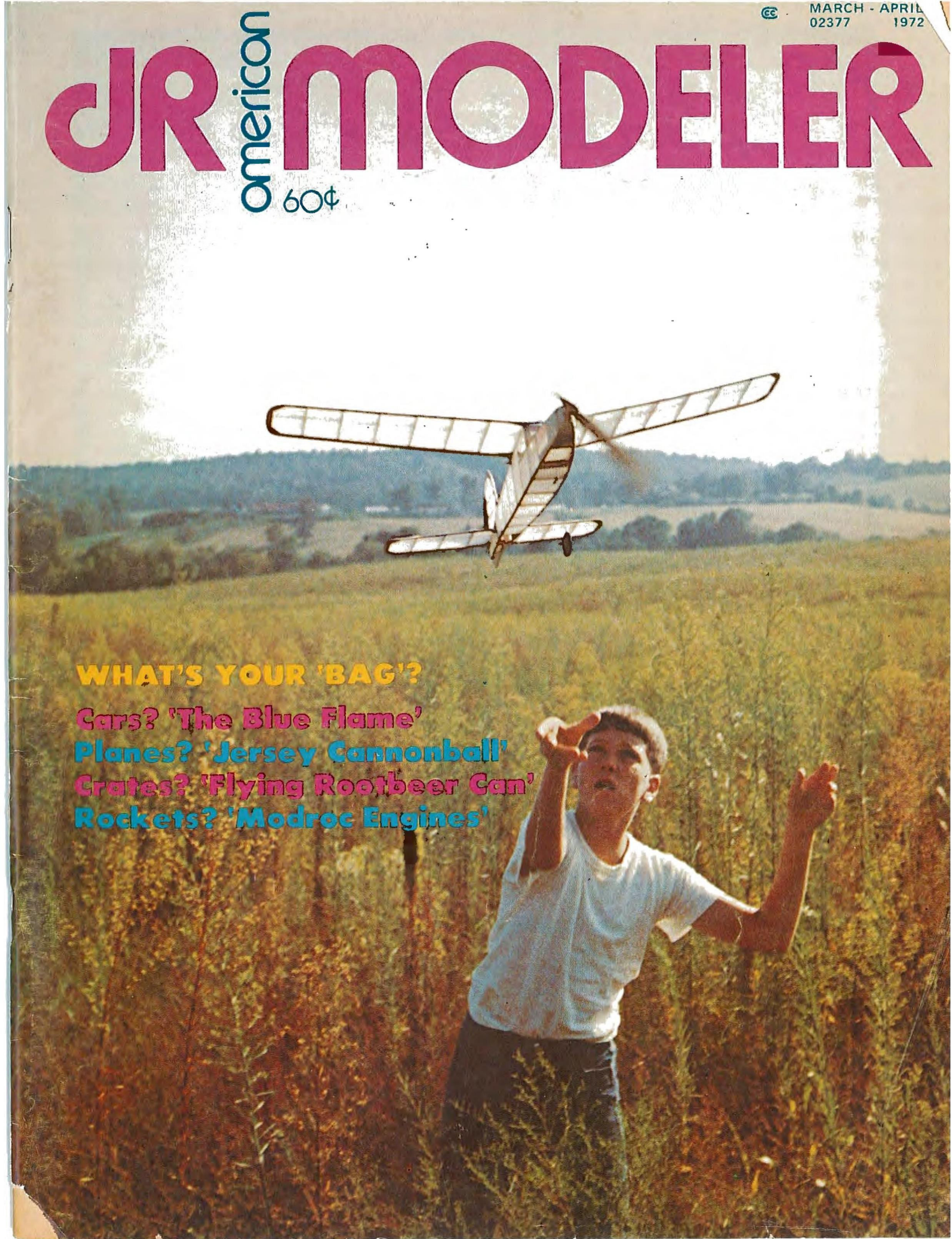
MARCH - APRIL
02377 1972

american JR MODELER

60¢

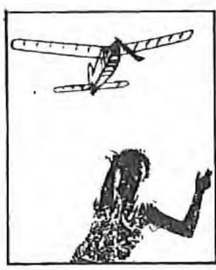


William J. Winter
Editor and Publisher

Thomas L. Murphy
Art Director

Anne R. Fuhrken
Assistant Editor

Joseph R. Wright
Circulation



See page 18

See page 34

See page 28

JR. american MODELER

THE HOW-TO-DO-IT MAGAZINE FOR THE BEGINNER AND SPORT FLIER.

VOLUME 1, NUMBER 3 MARCH-APRIL 1972

Published bi-monthly by Potomac Aviation Publications, Inc., 733 Fifteenth Street, N.W., Washington, D.C. 20005. William J. Winter, Publisher; Edward C. Sweeney, Jr., President; Harvey E. Cantrell, Secretary and Business Manager.

ADVERTISING DEPARTMENT
733 15th Street, N.W., Washington, D.C. 20005 (202) 737-4288

Western Advertising Representative: Aaron D. Viller & Associates, 5311 Venice Blvd., Los Angeles, California 90019. Tel: (213) 939-1161

Midwest and Eastern Advertising Representative: Boynton and Associates, 462 Rugby Rd., Barrington, Ill. 60010. Tel: (312) 381-7726.

Subscription Rates: In U.S., Possessions and Canada, 6 issues $3.00, 12 issues $6.00. Elsewhere, 6 issues $4.00, 12 issues $8.00. Payable in advance. Single copies, 60 cents. Six weeks are required for change of address. In ordering a change, write to JR. American Modeler, 733 Fifteenth Street, N.W., Washington, D.C. 20005. Give both new and old address as printed on last label.

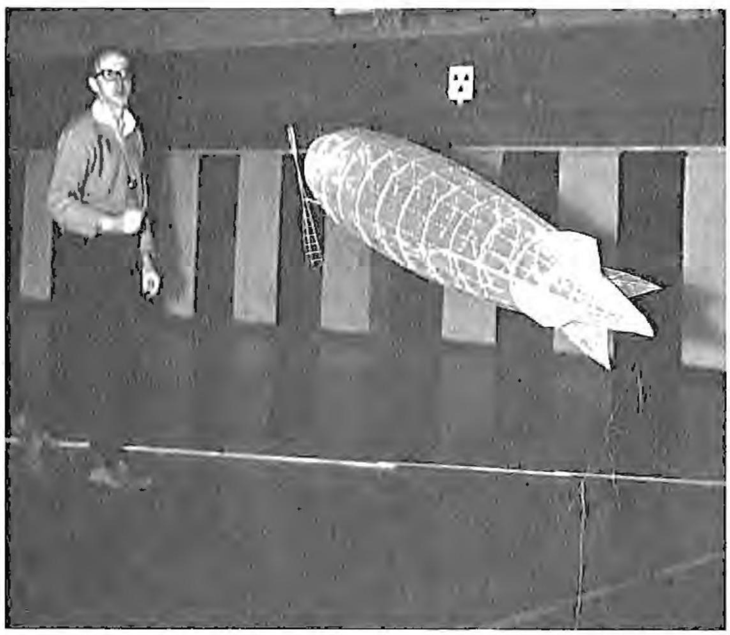
We cannot accept responsibility for unsolicited manuscripts or artwork. Any material submitted must include return postage. When writing the editors address letters: Editorial office, JR. American Modeler, 733 Fifteenth Street, N.W., Washington, D.C. 20005.

Postmaster: Send Form 3579 to JR. American Modeler,
733 Fifteenth Street, N.W., Washington, D.C. 20005

Jam

The great rigid airship is the dinosaur of aviation. The relatively tiny Goodyear "blimps"—seen on TV, flying over bowl games—only hint at the majesty of those enormous dirigibles which terrorized England during World War I. Decades of promising development ended with the fiery loss of the hydrogen-filled German Hindenburg at Lakehurst, N.J. in 1937, and with the losses of the U.S. Navy Akron in a storm in 1933 and the Navy's Macon by structural failure in 1935. The huge airship docks at Lakehurst, Akron (in which the Macon and Akron were built), and Santa Ana testify to the size of these "prehistoric" machines.

Lighter-than-air craft fascinate modelers, but few have had the skill and perseverance to tackle such a project. A huge (probably 15-ft. long) gas-engined blimp was flown outdoors during a Plymouth International meet at Detroit in the early 1950s. Dave Gray demonstrated one indoors on a tether during a Toledo RC show. And in the photo on the right, indoor-model builder Bill Bigge flies his scale (except for the rubber-powered indoor-type propeller) British R-100. Built to a 1-to-160 scale, it is 52 inches long and weighs only 1.38 oz. Its displacement is 1940 cu. in. One row of knots in a loop of .041 Pirelli rubber, drives the 15-inch diameter, 37-inch pitch prop for a speed of about 2 feet per second. The hull weighs .175 oz., including .078 oz. for covering. The structure could be 4½ times heavier and still float on stove gas. Adequate performance could be had in one as small as 27 inches long, or full scale details could be added or extremely light radio control used. But we oversimplify. We do not recommend trying to build one. Filling and venting problems must be handled precisely. Hydrogen is dangerous—remember the Hindenburg!



Bill made his hull from .036 sq. balsa and .001 Dacron bracing. Each 16-sided polygonal ring was assembled on a board, with eight diametrical braces tied and glued together at the center of each ring. He bent one stringer over the plan, marked ring locations then laid that stringer flat with others adjacent and marked all for locations. Building began at the stern, with two joined stringers and the smallest ring, hung from the ceiling like an A-frame. Let's just say he went on from there.

The real R-100 was built in 1929 to carry 100 passengers, and lived only 2 years. It had 5,000,000 cu. ft. capacity. The 804-foot Hindenburg had a 7,063,000 cu. ft. capacity and cruised more than 8,000 miles with 50 passengers at 78 mph. Airships can hover. The Hindenburg once rode out a South American revolution before landing! It had a piano in the lounge and a promenade observation deck. Our own Macon and Akron had a 6,500,000 cu. ft. capacity. However, it was Germany who excelled in the building of rigid airships.

Count Zeppelin's name was more sinister in World War I than that of Snoopy's rival, the deadly "Red Baron." His firm turned out 88 airships during WW I, and 20 were made by another firm. Mass raids did small damage, but the British were forced to concentrate an enormous effort at home—recalling fighters from the front, thus yielding the edge in France. Formations of Gotha (and other) bombers did more damage but, as in the Battle of Britain in WW II, the aerial onslaughts were defeated. Zeppelins became flaming torches once airplanes could climb high enough to reach them. By 1918, Zeppelin was turning out 2,400,000-cu. ft. monsters capable of carrying 50 tons. Machine gun nests were located on top, and sometimes an observer's basket on a cable would be lowered through the clouds.

In building the Macon and Akron, Goodyear acquired patents and processes from Zeppelin. These U.S. ships carried five fighters in a hanger, launched and landed by a trapeze. German-built craft proved structural integrity. Our own Los Angeles (eventually decommissioned—a novelty for us) was built by Zeppelin under WW I reparations and delivered in 1924 by a transatlantic flight. Hundreds of the rigid airships were built. The British made some, the French a few, but France, England, the United States, and then Germany threw in the sponge. The inability of Germany to obtain helium for the Graf Zeppelin before World War II—and the war itself—doomed the giant cigars.

Airship development was never fulfilled. Goodyear had plans for high-speed giants, perhaps with propellers mounted in a bow-to-stern internal tube. (Modelers will think of ducted-fan powerplants.)

With his R-100, Bill Bigge relives air history. We don't have to build dirigibles to share his pleasure. Through scale models we can relive any period we wish. The chap with the radio controlled Fokker Triplane, Nieuport 17, or SE-5 is less scientifically involved than Bigge, but if action is his bag, he has his fun. Through radio or control-line we can identify with any subject we wish. Some are good for free flight. How many have built Mustangs? Or Goodyear-type racers? Between-the-wars antiques? A fantastic variety of plastic scale kits give pleasure to those who prefer assembly, painting, and display of "real airplanes."

Incidentally, the entire "rigid" program in the United States cost less than the construction of LaGuardia airport in the late 1930s—$43,000,000. Had not the Hindenburg burned and WW II intervened, what might have happened to the dirigible?

Q. & A.

by DICK BURKHALTER

This column is based on the premise that there are no stupid questions, only stupid answers. I don't mean to imply that this will be a column of stupid answers, although some of my friends may argue that point! I will draw upon what is laughingly known as my years of experience to answer questions from you newcomers to the model-building fraternity. So if you're confused, bewildered, or just plain curious, speak up. In each issue I will attempt to answer as many reader's questions as possible. I would like you to think of this as *your* column.

Q. My Cox .049 engine starts and runs backwards about half the time. What can I do to prevent this?

A. The ability to run equally well in either direction is a characteristic trait of all reed-valve engines, such as the Cox. Here is a list of possible things you can do.

1. Equip the engine with a spring starter, supplied with most of the Cox ready-to-fly plastic planes. The inertia provided by the spring will usually insure a start in the proper direction.
2. Flip the prop backwards when starting. If the engine usually starts in reverse with a forward flip, it often will start forward with a reverse flip, right?
3. Carry a rag with you. Handy for cleaning up the slop deposited on your plane, it also is a good engine-stopper. Just throw it into the prop when it starts in reverse, and try again.

Q. I read that airplanes should take off into the wind, but when I try that with my control-line plane, it comes in on the lines just as it gets airborne. What am I doing wrong?

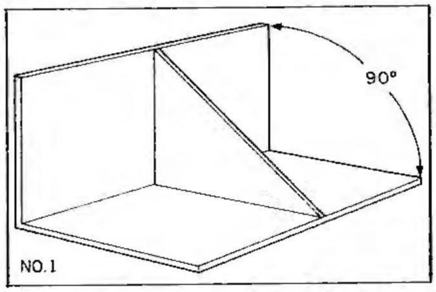
A. You are right about the wind direction for takeoff. However, you must remember that it takes time for the plane to build up flying speed. Most control-line planes take one-quarter to one-half a lap to reach takeoff speed, so if you start out pointed into the wind, by the time the plane is ready to fly it is broadside to the wind or downwind. For this reason you should begin your takeoff roll downwind. The wind will then help the model stay out on the lines as it lifts off.

Q. I would like to fly from a grass field, but when I try to take off, the plane's wheels catch in the grass and it noses over. What can I do to avoid this?

A. The easiest solution is to use larger wheels, as long as this will not cause the model to be too nose-heavy. You don't have to increase the diameter so much, but get the widest tires you can find, as they will roll over the grass easier than narrow ones.

Q. How can I hold parts at perfect right angles to each other while the glue dries? I have tried lining things up with a draftman's triangle, but unless I hold everything still while the glue is drying, the parts shift and I end up with a crooked model.

A. The solution to this problem is to make jigs to hold the parts in place. In most cases, jigs can be made easily and quickly using scrap balsa. For instance, you can make triangles from the corners of die-cut sheets. (Be sure to check them to insure the corners are perfectly square, and trim if necessary.) These triangles can be pinned or temporarily glued in place. Another solution is to build a bunch of re-useable jigs such as



NO.1

shown in the drawing below. If these are made from stiff poster board, 1/16" plywood, or plastic, they will last a long time. Wax the outside surfaces with ordinary paste wax to keep them from sticking to the work.

Q. I have a couple of engines from plastic ready-to-fly planes. I would like to use them in other planes, but have no gas tanks as the tanks were molded into plastic planes. What kind of tank will fit?

A. If these are Cox engines you are talking about, you can get replacement gas tanks from your local hobby shop which bolt onto the back of the engine. Replacement tanks for other engines should be easily available also, as are many universal tanks made of metal or plastic. Check for them at your dealer. A 1 oz. size should be about right for your purposes.

Q. What do the terms Wash-in and Wash-out mean?

A. These terms refer to intentional twists built into an airplane's flying surfaces for controlling roll stability. Wash-in places the wing tip at a greater angle of attack than the wing root (leading edge higher at the tip), while wash-out places the wing tip at a lower angle of attack (trailing edge high at the tip). Wash-in increases roll sensitivity and is used to make an airplane roll and spin easily. Wash-out has the opposite effect, making the plane less prone to roll or spin. Wash-out also delays a wing tip stall, while wash-in may cause it to stall before the center of the wing. Many real planes use wash-out to improve their lateral stability, such as resistance to spins.

Q. The soldered-washer retainer on my elevator pushrod came off in flight, causing a total wipeout of my plane. What can I do to prevent this from happening in the future?

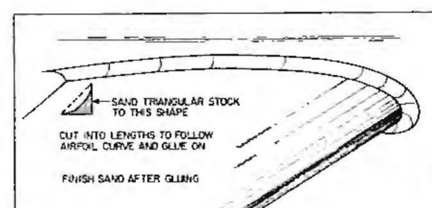
A. To begin with, try to avoid soldered retainers, using Z-bends in the pushrod instead. If you must solder, make your bends so that centrifugal force tends to keep the rod in place even if the retainer falls off. (The bent ends should face the outside of the circle.) Perhaps you can make the bent ends of sufficient length that they can't come out of the bell-crank or control horn.

[On the subject of soldering, remember that the solder should melt from the heat of the parts being joined, not from direct contact with the soldering iron. Be sure that the pieces to be joined are clean and free of oil, dirt or other foreign matter. Shine them up with fine sandpaper or steel wool. Use an acid-core solder (but never use acid-core solder for electrical wiring), and don't move the joint while it cools. After the work has cooled, wash the joint with a solution of baking soda and water and apply a light coat of oil to prevent rusting.]

Q. How can I make clean, uniform fillets for wing-fuselage joints, which will not crack out after a few flights?

A. I assume you have been trying to make fairly deep fillets with plastic balsa or other paste material. These work fine where a lot of bulk is not needed, but are prone to shrinkage and cracking when put on in great gobs. Try leather or balsa fillets instead. Leather fillet material is available in many sizes, and is the easiest way to make a continuous size fillet. The leather can be glued to balsa using regular model airplane glue, and since it is flexible, will follow the airfoil contours readily. At the sharp curve of the leading edge, you

NO 2



NO 3

will have to make cuts in the leather. These are later filled in with plastic balsa. At the trailing edge, an angular cut on the back (rough) side of the leather will allow the upper and lower fillets to meet in a pleasing joint.

Balsa fillets are made using triangular stock, sanded to shape with sandpaper wrapped around a dowel of the proper radius, and cut to follow the airfoil curve. The two illustrations should help you understand the techniques of each method.

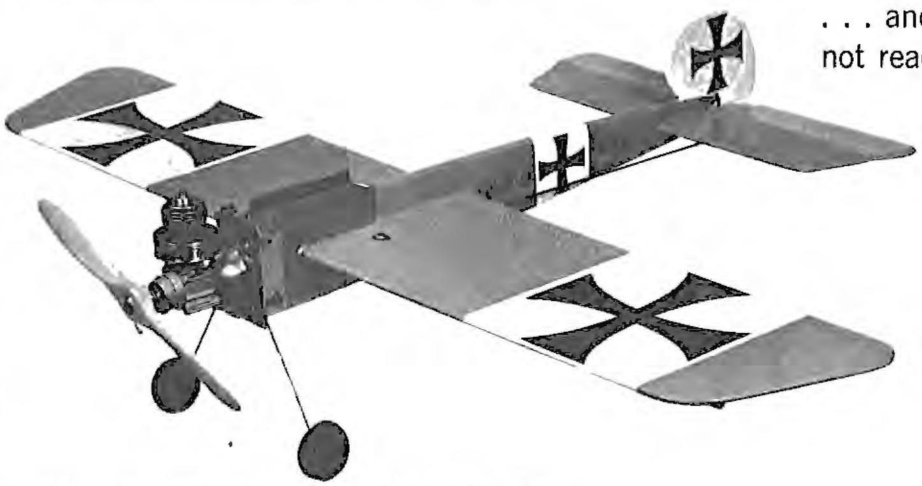
Q. What is meant by propeller pitch? How does one know what pitch prop to use with his particular plane and engine?

(Continued on page 48)

if you want some fun

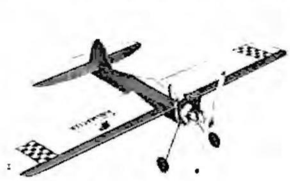
. . . then go out and get yourself one or more of these nifty little Control Line models.
And are they simple! Kits contain from 6 to 9 die-cut Balsa parts as well as the metal engine mounts, complete Control System (less lines and handle), Landing Gear, Wheels, authentic Decals, etc., all ready to use, which makes assembly a cinch IN ONLY MINUTES!
Almost any .049 Engine can be used and the flight performance is just great.
. . . and if you bash the ground "when you're not ready to land," they're so light and strong that they're practically damage-free.
By the way, Engines from most ready-to-fly plastic models can be used, so if you have one, don't waste it. It might require a little modification to install, tho.
Plans are easy to read and complete. They even have a run-down on beginners' first time flights.
There are six models at $2.95 and one Bipe (double winger) at $3.50, all about 21″ wing span; and all the tools you need are generally found around the house.
. . . so get over to your dealer's and take a look . . . at $2.95, you'll find they're the MOST . . . for your fun . . . for your money.

KIT S-35 BEGINNERS THUNDERJET 2.95



KIT S-37 BEGINNERS EINDECKER 2.95

KIT S-36 BEGINNERS SUPER CUB 2.95



S-30 BEG. RINGMASTER 2.95

S-32 BEG. RING. BIPE. 3.50

S-34 BEG. SPITFIRE 2.95

S-31 BEG. MUSTANG 2.95

Sterling MODELS INC.
PHILA., PA. 19144, USA

AVAILABLE IN CANADA

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

STERLING MODELS • BELFIELD AVE. and WISTER ST. • PHILA., PA. 19144
If no dealer available, direct orders accepted—with 10% additional charge for handling and shipping. (60c minimum in U.S., $1.25 minimum outside U.S.)

- ☐ Catalog of entire line of airplane control line model kits, R/C scale and Trainer kits, boat model kits, accessories; etc. 25c enclosed.
- ☐ "Secrets of Model Airplane Building." Including design, construction, covering, finishing, flying, adjusting, control systems, etc. 25c enclosed.
- ☐ "Secrets of Control Line and Carrier Flying." Including preflight, soloing, stunting, Carrier rules and regulations, Carrier flying hints and control line installation instructions. 25c enclosed.

Name ____________________
Address ____________ City ____________ State ______ Zip ______

CARL GOLDBERG

start with the models that really *Fly!*

"RANGER 28"

Every Carl Goldberg Model Has . . .

- ✓ *Each Step Clearly Pictured*
- ✓ *Proven Flying Performance*

• FREE FLIGHT

BEGIN WITH RUBBER POWER!

Ranger 28

RANGER 21 — All die-cut balsa parts. 21" span beauty. **$1.98**

RANGER 28—"Pre-fab plus paper." 28" span, 2 colors. **$1.98**

SHOESTRING RACER — 18" span. All die-cut balsa. **$1.98**

CESSNA 180 — The champion of business liners, 21" span. **$1.98**

SPIRIT OF ST. LOUIS — A miniature duplicate, 21" wingspan. **$1.98**

SOAR WITH FREE FLIGHT!

½A Viking

½ A BLAZER — Die-cut balsa, tissue, 40" span, for .049 engine. **$4.95**

RANGER 30 — Die-cut balsa, 30" span, for .010-.049 engine. **$3.95**

VIKING — 48" span, Hi-thrust, for .049-.051 engine. **$5.95**

• CONTROL LINE

MOVE UP TO CONTROL LINE!

Stunt Man 23

LITTLE TOOT — Sporty Biplane, for .049 engine, all die-cut balsa. **$3.95**

LI'L WIZARD — Shaped balsa wing, die-cut fuselage, 21" span, for .049 engine. **$3.95**

STUNT MAN 23 — Die-cut balsa, 23½", for .049-.09 engine. **$3.95**

P-40 FLYING TIGER — 18" span, all balsa pre-fab for .049 engine. **$3.50**

LI'L JUMPIN' BEAN — 21" span Favorite ½A stunt model. **$3.50**

SWORDSMAN 18 — Die-cut balsa, 18" span, for .020-.049 engine. **$3.50**

PROFILE STUNTERS

Cosmic Wind

SHOESTRING STUNTER — 42" Top stunt model for .19-.35 engine. **$7.95**

WITTMAN BUSTER — 40" Sharp stunt model for .19-.35 engine. **$7.95**

COSMIC WIND — 43" span, for .19 to .35 engine. **$7.95**

• RADIO CONTROL

COMBAT

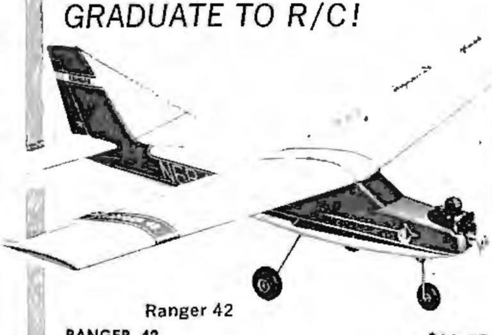
Voodoo

VOODOO — 36" combat-stunt for .19-.35 engine. .... **Single kit $4.95**
Double kit $8.95

JUNIOR SATAN — 29" span, combat-stunt, for .15 to .19 engines. **$3.95**

LI'L SATAN — 19" span, ½A combat-stunt for .049 engine. **$2.95**

GRADUATE TO R/C!



Ranger 42

RANGER 42 **$19.95**

CARL GOLDBERG MODELS INC.
2544 W. Cermak Rd., Chicago, Ill. 60608

I am sending 20¢ for 8 pg. Illustrated Catalog with "Recommendations in Starting in R/C," Basic Explanation of R/C Equipment, and Radio Control Definitions.

NAME________________

ADDRESS________________

CITY________________

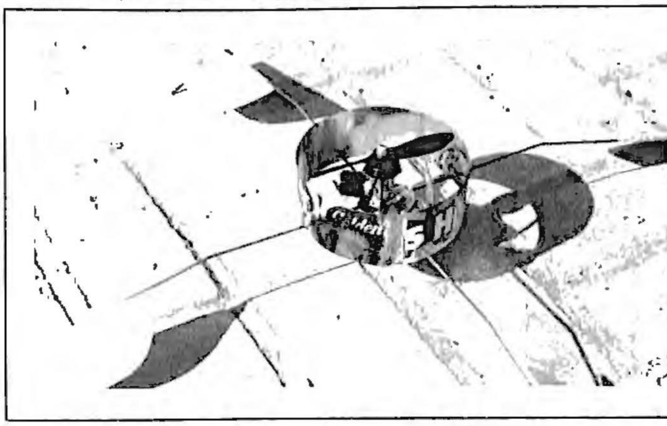
STATE____________ ZIP________

CARL GOLDBERG MODELS INC.
2544 WEST CERMAK ROAD • CHICAGO, ILLINOIS 60608

by KEES TALEN

flying rootbeer can

The prop rotates clockwise and, because of its torque, the entire machine (including the engine) revolves in the opposite direction.



Tired of going around in circles? Lost your free flight? Desire something new? What you need is a **Flying Rootbeer Can.** In any event, almost every modeler has an old .049 engine with rear engine mounts somewhere, or can get one from a friend, so let's get started.

The cost of this project is about one dollar if you have an .049. The following materials are required and are available at most hobby shops: two 36" pieces of 3/32" steel wire; one 2"x20" piece of balsa 1/16", 3/32", or 1/8" thick; one wedge-shaped fuel tank and one 4" piece of fuel line.

Two rootbeer cans (others may be substituted) will also be required. The cans must be made of tin since they will be soldered. Miscellaneous materials such as small strips of cloth, cement, plastic electrical tape, and paint, if desired, will also be required.

The only special tool you'll need is a soldering iron. If you don't have one, ask around the neighborhood. If you've never soldered anything, get dad, or someone with experience to help.

CONSTRUCTION: Before we start, let me remind you—*tin is sharp*—don't find out the hard way. Cut the cans into 2" wide strips by cutting around the can (avoid using the can seams). Join the strips together, overlapping approximately 1/2", and solder after scraping or sanding the paint and plating off the areas to be soldered. Bend the 2" strip to make a cylinder 1/2" larger in diameter than the prop you intend to use. My Wen Mac .049 has a 4.5" prop so the cylinder diameter is 5". Next, punch or drill four 3/32" holes evenly spaced around the can, 1/2" from one edge. Cut the 3/32" steel wire into two 28" pieces. (A metal cutting file is a big help.) Bend a U-shaped kink in the center of one wire so that a flat plate may be soldered to the intersection of the two wires. Push the wires through the holes in the can so that they make a large X and solder where they pass through the can. After the solder joints have cooled, put plastic electrical tape around the edges of the shroud to prevent any accidental contact with the sharp tin. Bend each of the protruding wires down about 30 degrees, 9" from the end (a cheap protractor can be bought in the "five-and-dime" or other handy store). Also bend the ends 90 degrees, 2-1/2" from the end to give a 30 degree pitch *opposite* to that of the engine prop. See the drawing because steel wire is hard to re-bend. The purpose of the blades is to add lift and drag when the engine starts rotating in a direction opposite to that of the prop.

Cut four balsa blades in the shape shown or make your own. Attach these blades as shown with cement and cloth strips. Wrap the cloth around the wire on both edges of the blades and overlap the balsa at least 1/2" on both sides.

The motor mount should be made out of a 1-1/2" diameter disk cut from a can lid which is a bit thicker than the sides. Drill the disk to fit the .049 engine to be used. Solder the fuel tank opposite the engine cylinder on the underside of the disk with the wedge to the outside. See the drawing for details. After removing the engine, solder the motor mount to the crossed steel wires (not sparing the solder). Rebolt the engine after the solder has cooled. Hook up the fuel line and presto you are now the proud owner of the **Flying Rootbeer Can.**

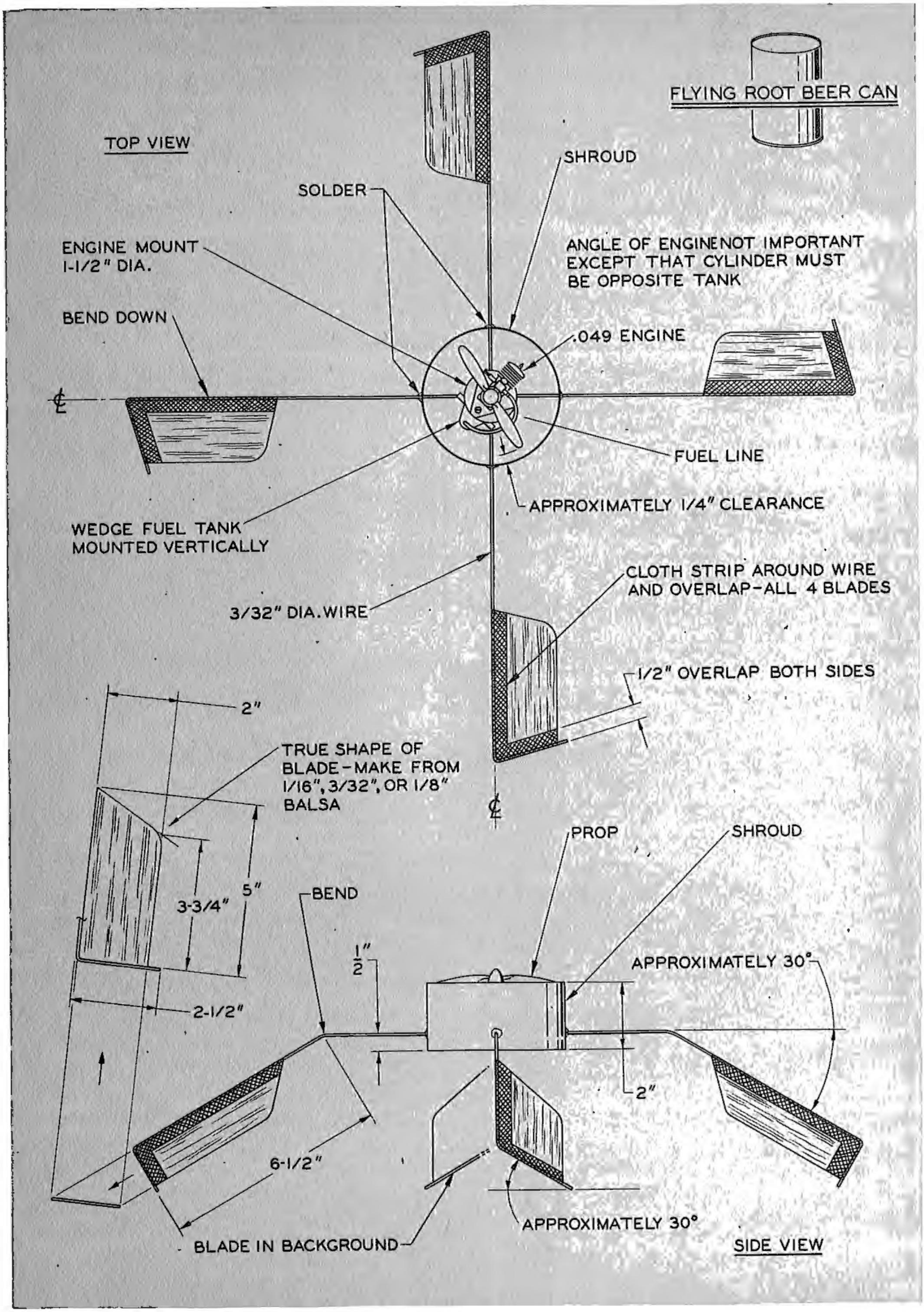
You can paint it, but somehow painting detracts from the novelty. Make sure the prop can rotate freely and all solder connections are solid. On some engines, adjustments of the needle valve may necessitate the removal of some motor mount material and a little practice in adjustment.

To fly the model, start the engine, hold vertically by the motor mount or shroud, and toss *gently* into the air. The engine should immediately start rotating clockwise and away it goes. Don't put too much gas in the tank for the first few flights and don't fly in windy weather unless you plan to chase it. The **Flying Rootbeer Can** can easily fly out of sight with a full tank on a windy day.

When the engine stops notice the peculiar way in which the model comes down. This is due to the equipartition (how's that?) of energy, which means that the model, after flipping over (prop down) and reaching a certain rotational energy, will invert (prop up) as the model tries to equate potential and rotational energies. The invert-invert cycle will repeat itself depending on the height reached by the model. Notice that the model does not impact the ground as hard as you might expect. The only damage I can recall seeing was a bent wire, landing on concrete and a couple of loose solder joints. Flying in a field is advisable.

As a final note, do not hesitate to change the design and try for improved performance. You might delete the shroud, make the shroud from balsa or cardboard, pitch the blades differently, increase or decrease the length of the steel wires, and maybe make a model ten times the specified size with an old .60! *(Oh, no! —Editor.)*

Have fun, and even if it flys off into the sunset you haven't lost a fortune. I lost one for a week once. You should have heard the fellow who found it in his backyard trying to describe what he had found. Make it a habit to put your name and phone number on any model.


FLYING ROOT BEER CAN
TOP VIEW
SHROUD
SOLDER
ENGINE MOUNT
1-1/2" DIA.
ANGLE OF ENGINE NOT IMPORTANT
EXCEPT THAT CYLINDER MUST
BE OPPOSITE TANK
BEND DOWN
.049 ENGINE
FUEL LINE
APPROXIMATELY 1/4" CLEARANCE
WEDGE FUEL TANK
MOUNTED VERTICALLY
CLOTH STRIP AROUND WIRE
AND OVERLAP-ALL 4 BLADES
3/32" DIA. WIRE
1/2" OVERLAP BOTH SIDES
2"
TRUE SHAPE OF
BLADE-MAKE FROM
1/16", 3/32", OR 1/8"
BALSA
PROP
SHROUD
3-3/4"
5"
BEND
1/2"
APPROXIMATELY 30°
2-1/2"
2"
6-1/2"
APPROXIMATELY 30°
BLADE IN BACKGROUND
SIDE VIEW

ahoy!

Cute describes **Skippy** perfectly. Only 12 inches long and easy to build, it takes about two hours of working time. (The over-all time is longer because glue and paint must dry.) The kit directions are excellent and as complete as any we have seen.

An important point: read the directions thoroughly. Don't just skim over them. Every detail should be understood.

Building **Skippy** is one thing—sailing it is another. That is where it shines! In addition to being a good sailer, it also has a most useful gadget which always returns **Skippy** to shore as long as there is a breeze to move it.

The "return" to shore" feature is simple to set—after a little experimenting familiarizes the skipper with its characteristics. From then on, **Skippy** sails merrily out from shore and, at the right time, turns and starts its return trip. There are no strings to hold and no radio control is needed. Of course, it doesn't return to the exact spot from which it started, but depending upon the wind and the shore line, it will come back to within a reasonable distance from its departure point. All in all, it's a splendid boat for the beginner.

The hull is a solid piece of balsa and is completely shaped with all important holes drilled. We gave it two coats of clear dope to seal the grain and the end pores. Then a light sanding with very fine sandpaper and the hull was ready for painting. The cabin material furnished is mahogany and the builder can, if he chooses, give it a coat or two of mahogany-colored varnish after it is assembled, or, merely give it a couple of coats of clear dope when doing the hull. The directions recommend varnish for cabin and spars. We had no varnish, but we did have plenty of clear dope, so that is what we used. (Also dope dries faster.)

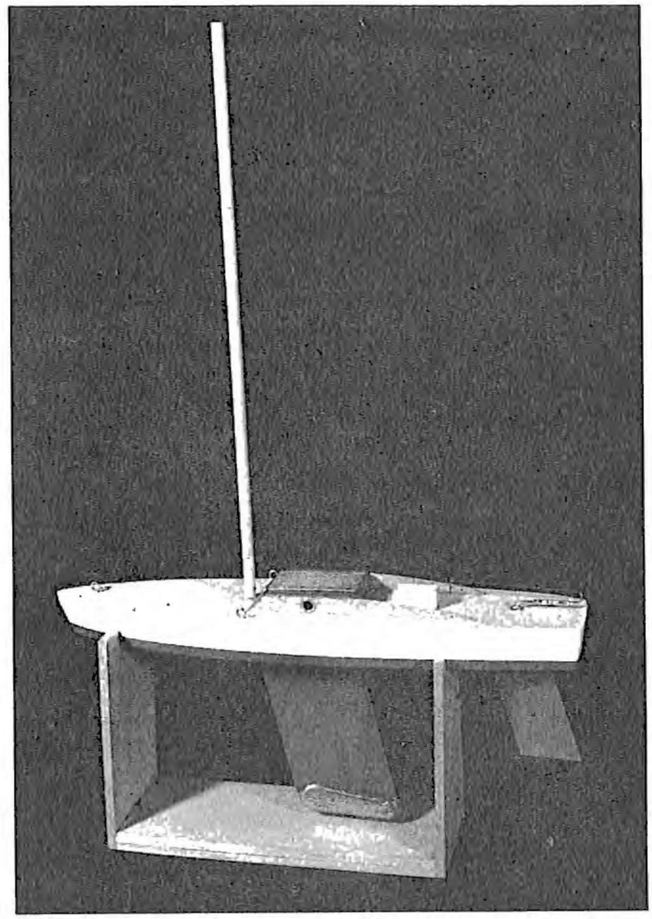
To go through the construction, step by step, is unnecessary because the directions furnished are sufficiently detailed. However, we do have a few helpful suggestions.

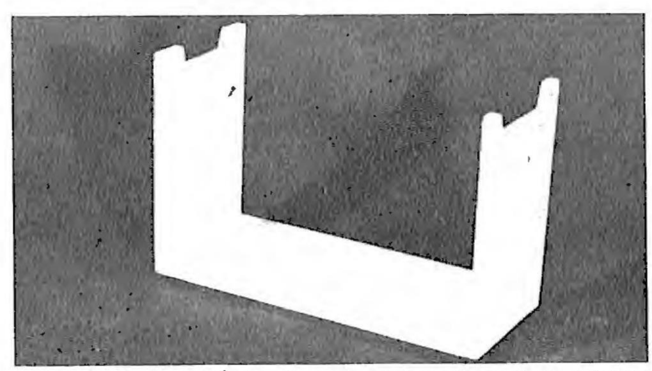
Both the mainsail and jib are of very light, thin plastic material. To hold the sail in place, there are three holes in the jib and five in the mains'l. Tiny brass eyelets are passed through the holes and a washer placed over each eyelet. According to the directions, a nail is used to enlarge the hole in the eyelet on the washer side. The nail should be larger than the hole so that when it is hit carefully with a hammer, the eyelet will spread to approximately the size of the hole in the washer. Then the eyelet is hammered lightly on the washer side, so that the eyelet and washer have reinforced the hole in the plastic sail.

We found that while this worked some of the time, a few of the eyelets closed up completely and thus the thin thread furnished could not pass through.

We found a simpler and easier way to secure the washer to the sail without using the eyelet: merely place the washer over the hole in the sail and press about a half an inch of Scotch tape over the washer so that it is held tightly to the sail. Turn the sail over and place another piece of Scotch tape over the same spot. This secures the washer in place and also keeps the sail material perfectly flat. Do this for each hole.

Next, take a small nail whose diameter is slightly smaller than the hole in the washer. Place that portion of the sail where the washer is located over a small piece of scrap balsa or other wood. Hold the nail with a pair of pliers and heat it just hot enough so that it will melt its way through the Scotch tape. Practice first on a separate piece of tape to determine just how much to heat the nail. Don't make it too hot or it will char the material and make a black circle at the hole. And don't heat the end of the nail red hot or even approaching that temperature. Just be sure it is hot enough to melt (but not burn) its way through.





Skippy ready for her sails. Hull is precut to shape. Note weighted keel and the generous rudder area. Simple mount devised by author makes it easier to work on boat in later stages—and you can stand it up for display. Stand can be painted white, as in lower photo.

by CLIFF PETERS

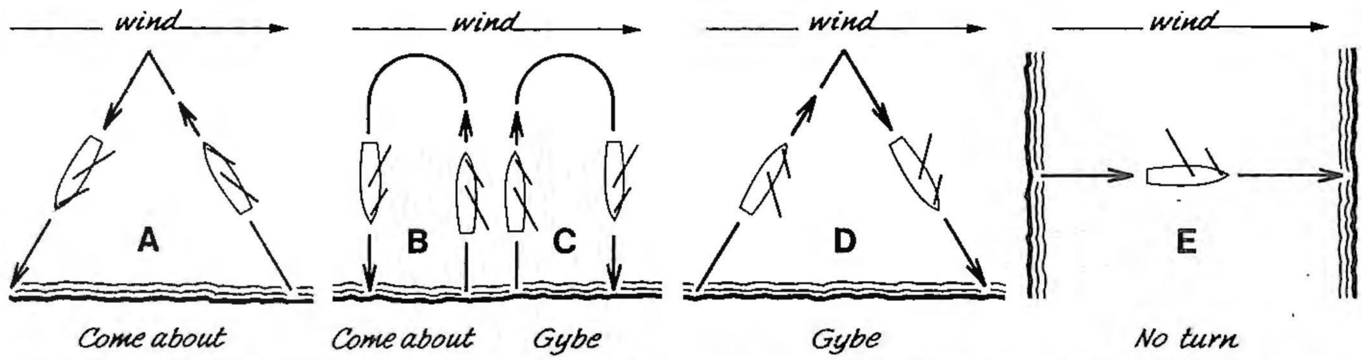


DIAGRAM	NAME OF MANUEVER	TRIM OF SAILS	LOCATION OF KNOT ON TILLER	TILLER TENSION
A	Come about	Close Hauled	Foreward of Rudder Post	Knot closer to post
B	" "	*Eased	" " "	Knot further from front of post
C	Gybe	Eased	Aft of Rudder Post	Knot further from rear of post
D	Gybe	Well out	" " "	Knot still further from post
E	No turn or Gybe to opposite side	Way out	More aft of Rudder Post	Knot even further from rear post

Set Boom out as per sketches for each course - NEVER PULL IT IN FLAT

Post is pivot point of rudder.

*If boat refuses to come about, sails are too far out, trim flatter. If boat now returns too far up wind, move knot back on tiller arm to get more rudder action. To turn left, tie limit cord to right cabin side. To turn right, tie cord to left cabin side.

The mainsail and jib are of light, plastic material. The cabin is mahogany, can be given a coat or two of mahogany-colored varnish.

At the top hole in both the mains'l and jib, use a longer piece of tape that extends up past the top of both sails. Then with scissors, trim the tape back to the edge of the sails. This will improve the appearance of the sails because they are made of very soft, pliable material. Without the reinforcement of Scotch tape, the top of each sail would fold down and appear a bit sloppy. The addition of the tape on both sides of each sail will stiffen the peaks enough to stand up just as they do in the full-size crafts. Since it is transparent, Scotch tape will not show; it also is strong. The use of tape is easier for small hands, and simpler than attempting to install both the eyelets and washers. However, there is nothing wrong with following the directions as supplied. The tape method is just an alternate way of handling a job which could give some builders a bit of trouble.

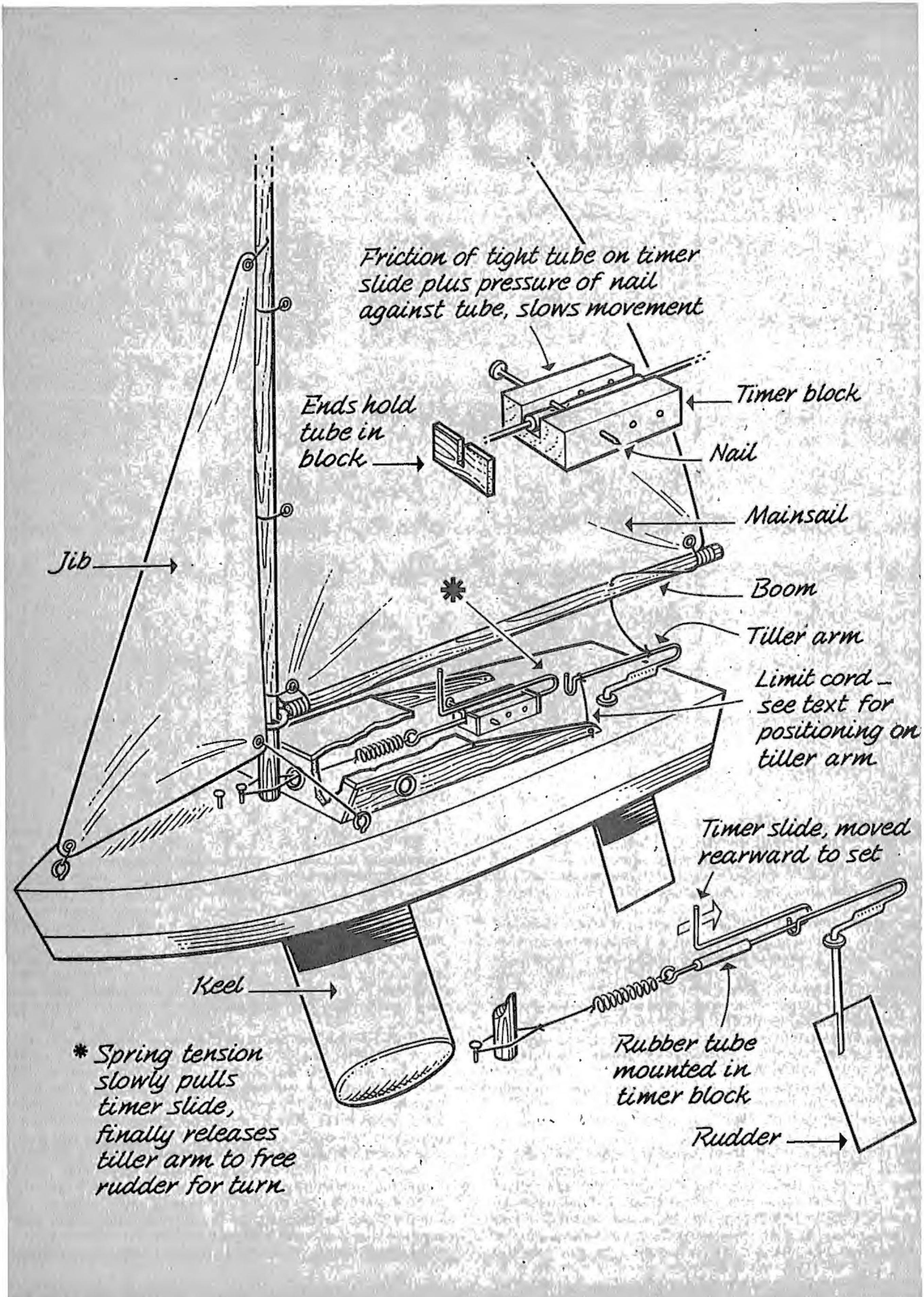
We also found that constructing a small stand to hold **Skippy** after the keel has been glued into place will make for much easier working conditions while completing the boat. After the craft is completed, the stand will hold **Skippy** upright as it deserves to be for show. There is no sadder sight than a sailboat with sails set, lying over on its side or leaning against some object.

For the stand we used a length of balsa 3" wide by 3/16" thick. The bottom consists of two pieces, 7½" long, glued together for double thickness. The two end pieces are 5" high. After the two bottom pieces are glued and dried, the two end pieces are nailed and glued to the bottom. (Use very small nails or brads.) Let the glue harden and when it feels secure, set the boat on the end pieces so that the hull is approximately centered.

Hold the boat securely in position and with a pencil, lightly mark the width of the hull on the top of each end piece. Then, with a sharp knife, notch each end piece about 1/8" deep (the width of the notch determined by the pencil marks just made). Sand the notches smooth so that the hull sits securely in position.

If you wish to paint it, black is often used for this type of stand. To give it a finished touch, obtain three small rubber grommets at a hardware store and glue them to the bottom—two near the corners of one end, and one at the center of the other end. By using three instead of four grommets, the stand will always be steady even if you place it on a surface which is not absolutely smooth.

Skippy is a mighty nice craft and even if it's only a foot long, it is a good sailer. It will give you many hours of pleasure.



Friction of tight tube on timer slide plus pressure of nail against tube, slows movement
Timer block
Ends hold tube in block
Nail
Mainsail
Jib
Boom
*
Tiller arm
Limit cord - see text for positioning on tiller arm
Timer slide, moved rearward to set
Keel
* Spring tension slowly pulls timer slide, finally releases tiller arm to free rudder for turn
Rubber tube mounted in timer block
Rudder

two bits

by PAUL F. DENSON

The Two-Bits design was begun a few years ago after I read the article, "Famous Free Flights," in the 1964 **American Modeler Annual.** I was looking for an oldtimer to reduce to ¼A (02 engine) size. Lou Garami's Half Pint caught my eye and inspired a twin-tailed version of Two-Bits which was called Quarter Pint. **Junior American Modeler** asked me to design something easier to build. I kept the same wing and designed a new fuselage and tail section. Two-Bits is constructed as simply as possible and retains all of its famous predecessor's flying characteristics.

I would emphasize the importance of studying the plans and reading carefully all of the building instructions before you start. Occasionally it is necessary to describe near the end of the instructions something that affects the building of the entire plane. Always cover the plans with plastic wrap or waxed paper (for protection from glue) before you build over them. Some day you or a friend might want to build another plane. Use any model airplane glue or cement.

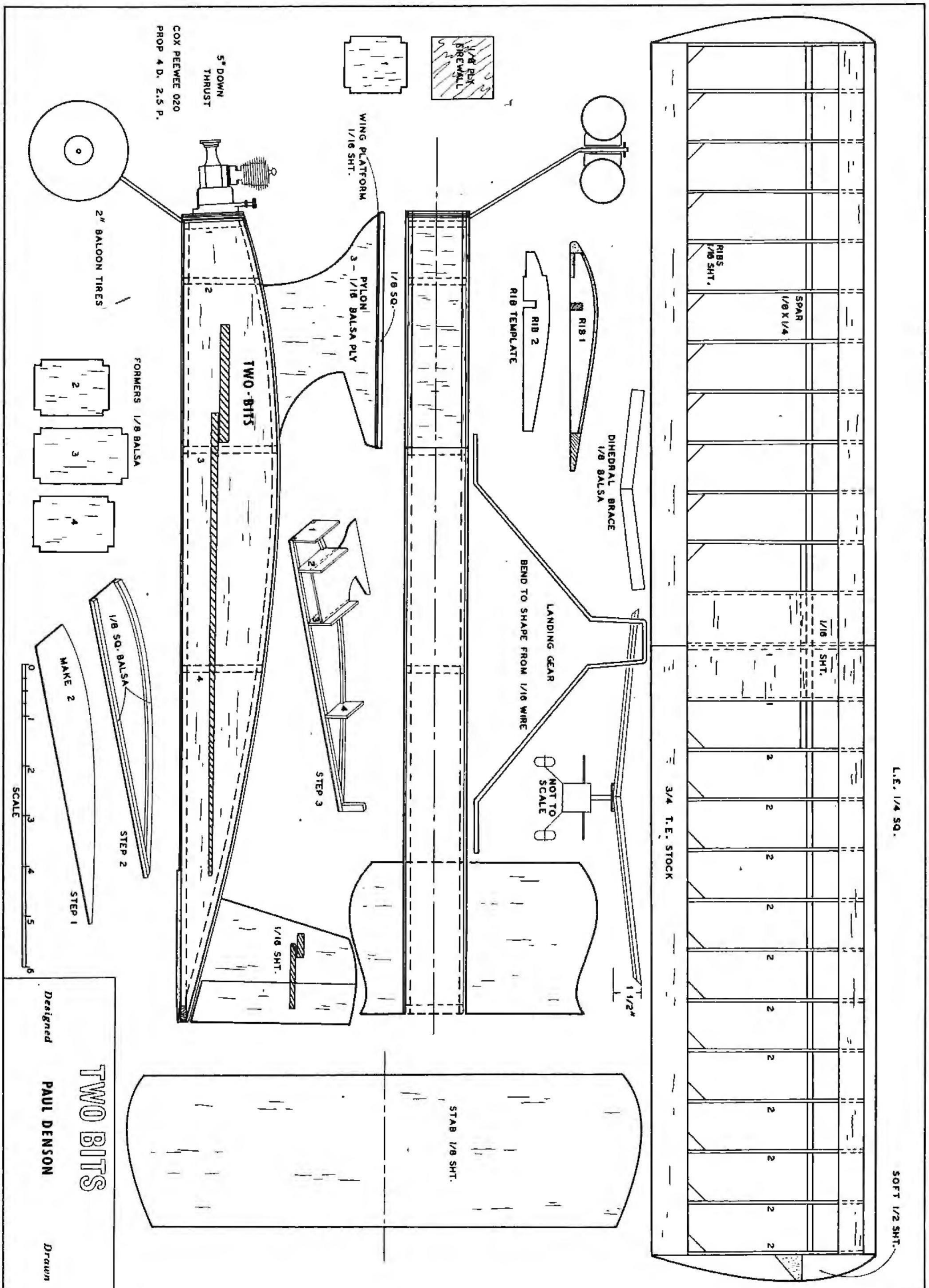
The fuselage is all sheet balsa, mostly 1/16" sheet. Follow Step No. 1 on the plans and cut two sides from a piece of 1/16" sheet. Cut the stabilizer from 1/8" sheet balsa. From the remainder of this sheet, cut the fuselage formers. In Step No. 2 glue 1/8" sq. strips on the top and bottom edges of each fuselage side piece as shown. (Be certain that you make a left and right side, not two the same.) Pin the right side to the plans and glue Formers 2, 3, and 4, along with the 1/8" by 1/4" balsa tail separator at the proper stations on the fuselage. While the glue on the formers is drying in place, cut out three pylon pieces from 1/16" balsa, two with the grain running horizontal and one with the grain running vertical. Cement these together like plywood (center piece vertical), and place under a stack of books or magazines to dry. When the pylon is dry (the next day), give it a light sanding with fine sandpaper and glue it in place between Formers 2 and 3 in accordance with Step No. 3 on the plans.

Bend the landing gear from 1/16" wire. Place the top of the landing gear on Former 1, outline it with pencil, then drill two parallel lines of 1/16" holes along these lines and sew the landing gear onto Former 1 with strong button thread.

Remove the fuselage from the plans and cement Former 1 (with the landing gear attached) in place, making certain that the wire does not stick out beyond the ends of the fuselage sides. Cut the firewall (engine mount) from 1/8" plywood. (If there is an R/C modeler in your area, ask him for a small piece of 1/8" plywood, since this is the only place you will need this material.) 1/8" Masonite will work just as well although plywood is stronger.

From your hobby shop, purchase a set of four blind mounting nuts to fit your engine mounting bolts. Install the blind mounting nuts on the backside of the firewall which then is glued to the ends of the fuselage sides. (Also coat your sewing job with glue.) If you have a two-part fast-drying epoxy glue, it would be best for mounting the firewall.

(Continued on page 50)



FULL SIZE PLANS AVAILABLE—SEE PAGE 48

Let it fly

by JOHN H. KRICKEL

"Charlie! Come to supper this instant!"

It's the fifth time your mother has called, so you figure you'd better go now.

"He's playing like he's flying that ol' model airplane around his room again," your little brother squeals from where he's looking through the crack in your almost-closed bedroom door.

"Oh, go eat a bug," you mutter, wondering how you can leave him at home tomorrow when you go to fly your new free flight gas model. Very carefully, you loosen the rubber bands holding on the wing and stabilizer, and gently lay it all out on your desk which has been converted into a workbench by laying a piece of plywood on top.

When you get to supper your little brother has already eaten your favorite piece of fried chicken so you kick him under the table while you ask your dad for the fortieth time what the weather is going to be like tomorrow. Late that night, as you lie in your bed, you think back on the weeks and weeks—it seems like years—since you started building the Starduster kit. It's your first power model and tomorrow, finally, you're going to fly it. Suddenly your heart skips a beat as you remember watching someone else's new model come spinning down and crash into pieces on its first flight.

Quickly, your mind changes to your favorite daydream—the one you dream as you hold the model and pretend it's flying: there you are, standing up in front of the crowd, and the announcer is saying, "First place in ½A Junior Free Flight goes to Charlie Hart, who has just set a new national record with his Starduster X!" Everybody is clapping loudly and you even manage to smile at your little brother. Maybe they'll take a picture of you and your model, like the one your dad has on his desk of him and his first model. He's told you a thousand times about the model—something called a Playboy Junior, and how he had to work a whole summer to earn the money to buy the Forster '29 engine.

It takes almost as long as Christmas, but morning finally comes. It's no use arguing with your mother, so you get ready for church without too much fuss, although it's already a beautiful clear day with just a few big puffy clouds. All the way through Sunday School your mind is seeing a red and yellow model streaking up into the blue sky with its motor screaming. After lunch—which your mother makes you eat—a couple of friends come by on their bikes as you're packing your model in the car, along with the cardboard box with the battery, fuel, and tools in it.

"Gee, it's a beauty. Did you *build* it?"

Dumb kids, as if you could *buy* a free flight model in a store already built, like some plastic control liner.

"Sure I built it."

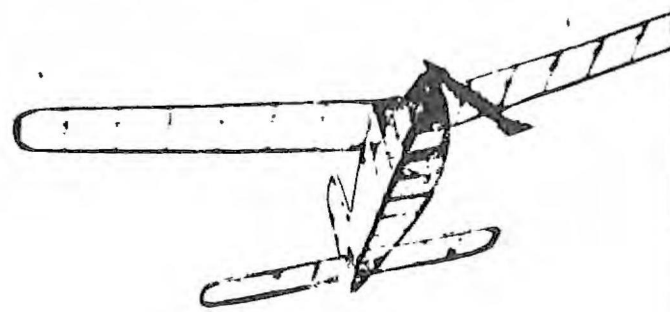
Then you have to explain why there aren't any lines coming out of the wing, and how it flies by itself. They seem pretty impressed, so you rubber band the wing and tail in place so they can see how it's going to look when it's flying. You decide they can go along to watch.

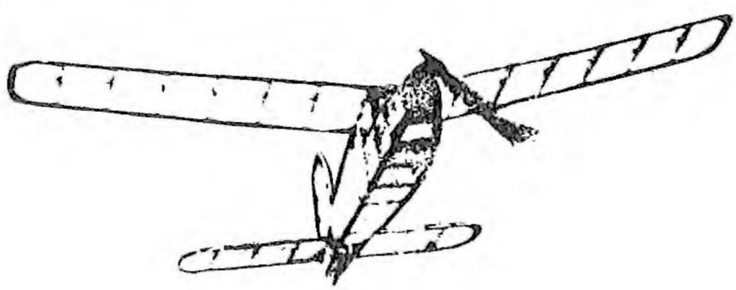
The ride to the field doesn't take long but you can hardly wait. There are a couple of cars there already when you arrive, but nobody is flying anything yet. Your fingers are kind of fumbly as you put the wings and tail on.

"Better glide it a time or two," your Dad cautions.

You face into the wind and give the model a hard heave. Up comes the nose and it climbs about 10 feet, then hangs there for a moment before dropping straight into the ground with a sickening crunch before you have time to catch it. The wing is slid around crooked and there's a tear in the paper when you pick it up. You straighten the wing under its rubber bands, and decide to ignore the torn paper.

"I think you threw it too hard," you Dad says, "better get over some tall grass next time."





This time, you run along with the model and aim it slightly down. It floats along like a feather for almost 50 feet before it just kisses the grass and stops. A couple of more glides and you add a thin piece of cardboard as incidence *(The positive angle at which the wing is attached to the body—Editor.)* under the leading edge of the wing to flatten out the glide even more. Now, you're ready. As you get out the fuel and batteries, you wish you had a fancy tool box like the big guys.

The propeller is on the engine backwards to hold down the power on the first few flights (a trick you picked up from listening to the guys at the model shop). You couldn't afford an engine timer but your dad helped you rig up a glass eye dropper fuel tank on the Baby Bee you salvaged from a crashed plastic control line model. The engine fires up with the first flip of the spring starter. Your heart is thumping so loud you wonder if people can hear it above the sound of the engine as you watch the fuel go down in the little glass tube. Now you face into the wind and hold the model over your head.

"Oh, please let it fly," you whisper, as you gently let the Starduster go. The model picks up speed and the nose comes up. It's climbing out now in a beautiful, slow, right-hand turn.

"Look at it go," your little brother squeals, as he runs around pointing.

"Climb, baby, climb!" you yell at the top of your lungs as you watch it go higher and higher.

The engine sputters and stops, and suddenly the model is floating like a big buzzard up there in the blue. It doesn't take too long to come down as it makes one big circle of the field. You feel so good you even let your little brother carry it back to the car while you and your friends talk about the flight.

"Maybe you'd better use a dethermalizer this time," your Dad says, sounding proud as punch.

"What's a dethermalizer?" your little brother wants to know, and you have to explain that it is just a short piece of clothesline fuse stuck in the rubber bands holding down the back of the stabilizer. When the fuse burns through the rubber bands, the stabilizer pops up and the model is supposed to come settling down like a parachute.

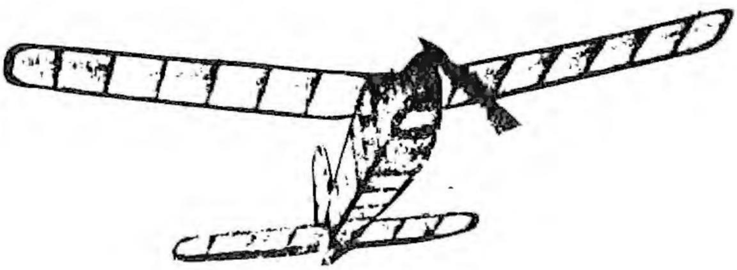
This time, you tune the engine carefully until it's really screaming. The fuse is lit just before you launch the model. It climbs out in a steep spiral turn. You're feeling like a king of the skies when all of a sudden you notice the turn getting tighter and tighter. Now one wing comes down and the model plunges into a sickening spin.

"Oh, no!" is all you can say because your mouth is all dry and your knees feel like jelly. About 20 feet off the ground, the engine quits; but the model is going so fast it whips around another full circle before straightening up and gliding out in a big stall.

"What went wrong?" you ask nobody in particular.

"You need a little rudder trim tab to control that turn," volunteers one of the big guys who is rigging up his own model.

Carefully, you cut a little tab in the back of your rudder and turn it away from the direction the model was spinning—a dab of glue holds it in place. The third flight has you scared, but you hope it doesn't show. This time the model climbs out in a beautiful, sweeping turn, almost straight up. When the engine cuts out, it rolls over into the glide—straight ahead! The trim tab took out all your glide turn! With your brother and friends close behind, you start running in the direction the model is heading. For a moment it's lost behind the wall of trees at the edge of the field, but you climb the fence in two jumps, and out into another, smaller field. The model is nowhere in sight!



Everybody spreads out to look and then, "I see it!" yells one of your friends. There's your Starduster—hanging in a tree at the far side of the small field. It takes some climbing to get there, but you finally get close enough to shake the limb holding the model and it drops into the grass below, popping off the wing and tearing some more paper. This time you carry the model as you lead the procession back to the car.

The fellow who told you about the trim tab is waiting.

"Put a wooden shim under one side of your stabilizer to tilt it. That will make the model turn in the glide in the direction that the stab is tilted up. It won't affect the turn at all while the engine is running. And remember, anytime you make a model *turn* you also make it *dive*. So put an extra 1/32" incidence under the wing leading edge to help the glide."

You carefully shim up the stabilizer until the left tip is about an inch higher than the right. It only takes a jiffy to add the extra wing incidence.

"This time is going to be it," you say. The Baby Bee has the propeller on forward and it screams like never before. Your dad barely gets the dethermalizer lit before you get the model away. The Starduster shoots forward like an arrow and banks into a nearly vertical climb.

"Climb, baby, climb!" You help it along. It's almost like that was *you* climbing up in the sky with the field and cars dropping away far below. The model is just a speck when the faint engine buzzing stops. The glide is in big, graceful left circles and it looks like it won't *ever* come down.

And all of a sudden you know it was worth it—the weeks of hard work and discouragement when you almost gave up. Maybe, finally you understand why your dad still talks about that old first model of his—that Playboy Junior, or something. There's no one applauding or handing you a trophy as you start after the model, but your friends are looking up at the Starduster with their mouths hanging open. And the big guy who helped you is saying, "That's a great model you've got there, Charlie."

Cannonball

The first thing I am asked when I fly this plane is, "What is it—a burnt pizza?" I reply, "If this was 1776 you'd know what it was. It's a Cannonball." Imagine how fast the Revolutionary War would have ended if a thousand of these could have been launched simultaneously! The soldiers would have dropped their arms in fright or gathered around to take their turns flying.

Seriously, you can make this plane into anything you want it to be; a smiling face, a half moon, a tire, a pizza, etc. Decorate it to your heart's content. It's great for a club contest to see who can be the most original. It flies very well—I'm sure you'll enjoy it.

FUSELAGE: The fuselage is constructed from ¼" balsa sheet. Take four 3"-wide or three 4"-wide sections and cement together so you can scribe a 12" circle on the assembly. With the grain running vertical, cut out the motor mount area, slot for the wing and for the stabilizer. At the opposite end of the circle from the motor mount, measure in 1" and cut a vertical section away and then re-cement with ¼" offset toward the outside of the flying circle. This is the rudder area. Make the firewall using 1/8" plywood and cement securely into the motor mount opening as illustrated. After the wing is cemented to the fuselage add balsa blocks behind the firewall to strengthen it and also provide more support for the wing. These blocks should be cut and blended to shape smoothly to the fuselage.

STABILIZER: The stabilizer and elevator are constructed of 3/32" balsa sheet. The two halves of the elevator are joined by using a 3/32" diameter hardwood dowel. The hinges are cut from nylon tape and cemented to the elevator and stabilizer in the staggered pattern as illustrated. A Perfect brand control horn completes the assembly. When cementing to the fuselage make sure the elevator can move freely. Make a larger clearance hole in the fuselage where the 3/32" dowel passes through.

WING: The wing can be made from 1/4" x 4" preshaped balsa glider wing stock usually carried by your local hobby shop. With this, all you have to do is sand the front of the airfoil to the correct shape. If the preshaped stock is not available you'll have to buy the regular stock and shape it completely. The wing is made in one piece (although the plans only show one half of the wing). The Perfect 2" bellcrank is mounted through a 1/8" plywood piece that is cemented to the underside of the wing. The leadout wire guide at the end of the wing can be made from 1/16" or 1/8" plywood.

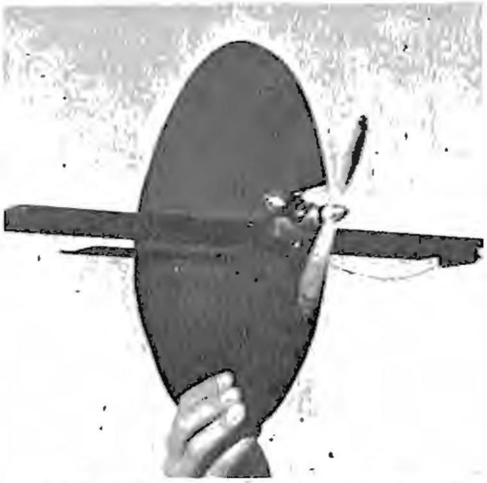
The pushrod can be bent from 1/16" dia. music wire, however, it is much easier to use a DuBro Kwik-Link, if your dealer has one. It has a threaded connector that can be adjusted easily for the correct length so that the elevator is in neutral when the bellcrank is positioned parallel to the fuselage. Hold the Kwik-Link against the fuselage, roughly noting where the rear bend has to occur for mounting to the elevator control horn. Bend end at a right angle leaving about ¼" length for passing through the horn with a washer soldered on the outside to retain in place. If the hole in the control horn is too snug, drill out for a free pushrod fit.

FINISHING: When the firewall, wing, and stabilizer are cemented to the fuselage, sand the assembly with fine sandpaper. Give two coats of clear fuelproof dope (butyrate dope is fuel-proof) sanding between and after the doping. I painted my plane black, but here is where you can let your imagination inspire the final appearance. I used Mono-Kote for the decorative trim.

ENGINE AND FLYING: The engine can be a Cox Baby or Golden Bee .049 displacement. Mount at the angle shown so the needle valve is free for your hand adjustments. The nylon prop has a 6" dia. with a 4" pitch.

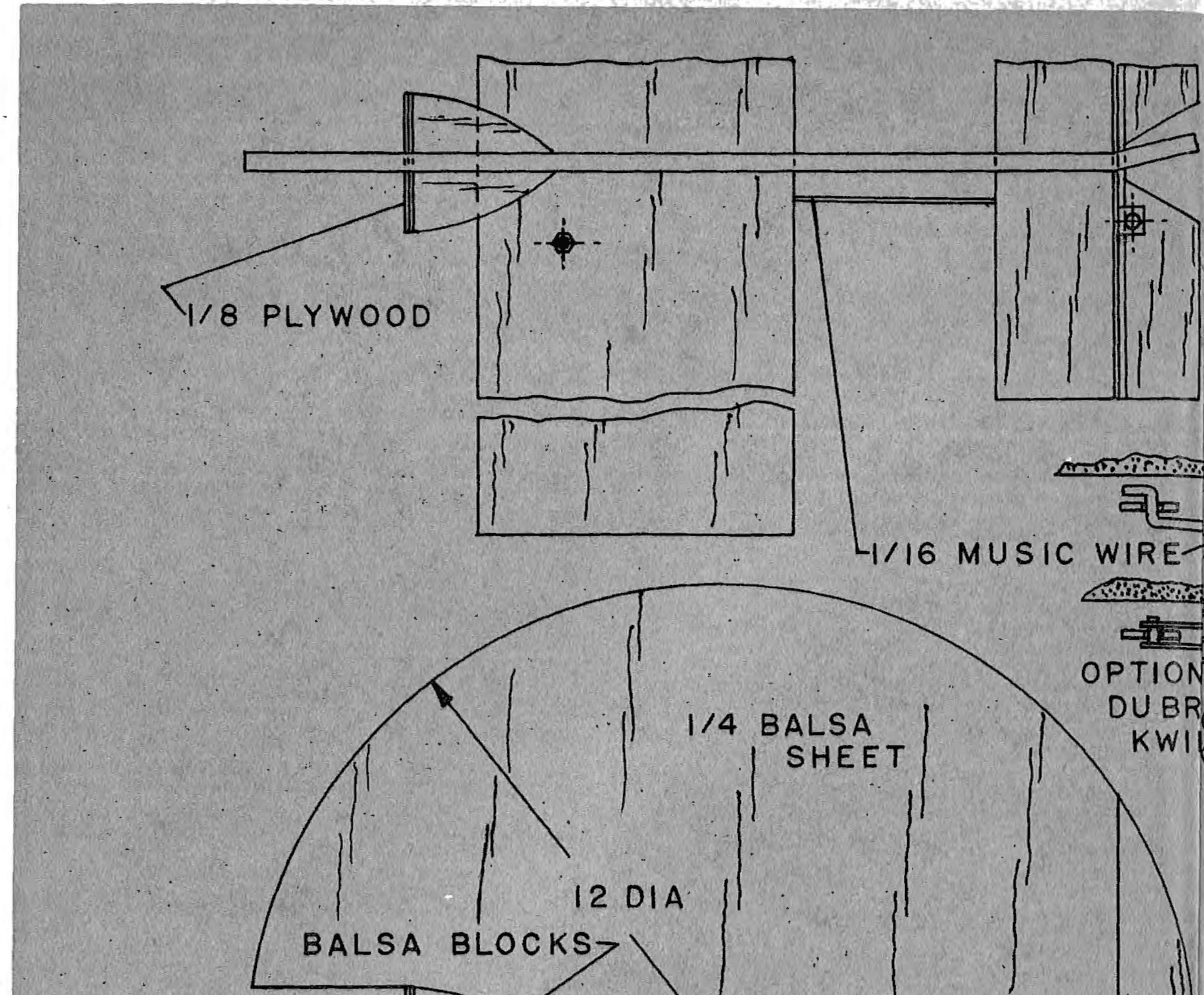
My plane was flown on dacron lines 28 feet long. Launch the plane in a slight nose up attitude. I suggest flying over grass since the landings are a little rough with the plane rolling when it lands. When the engine stops try to bring it in with the nose a little high. The engine is well protected and we have had no problems with the landings. Some of you junior engineers may devise a landing gear setup if you wish to do so.

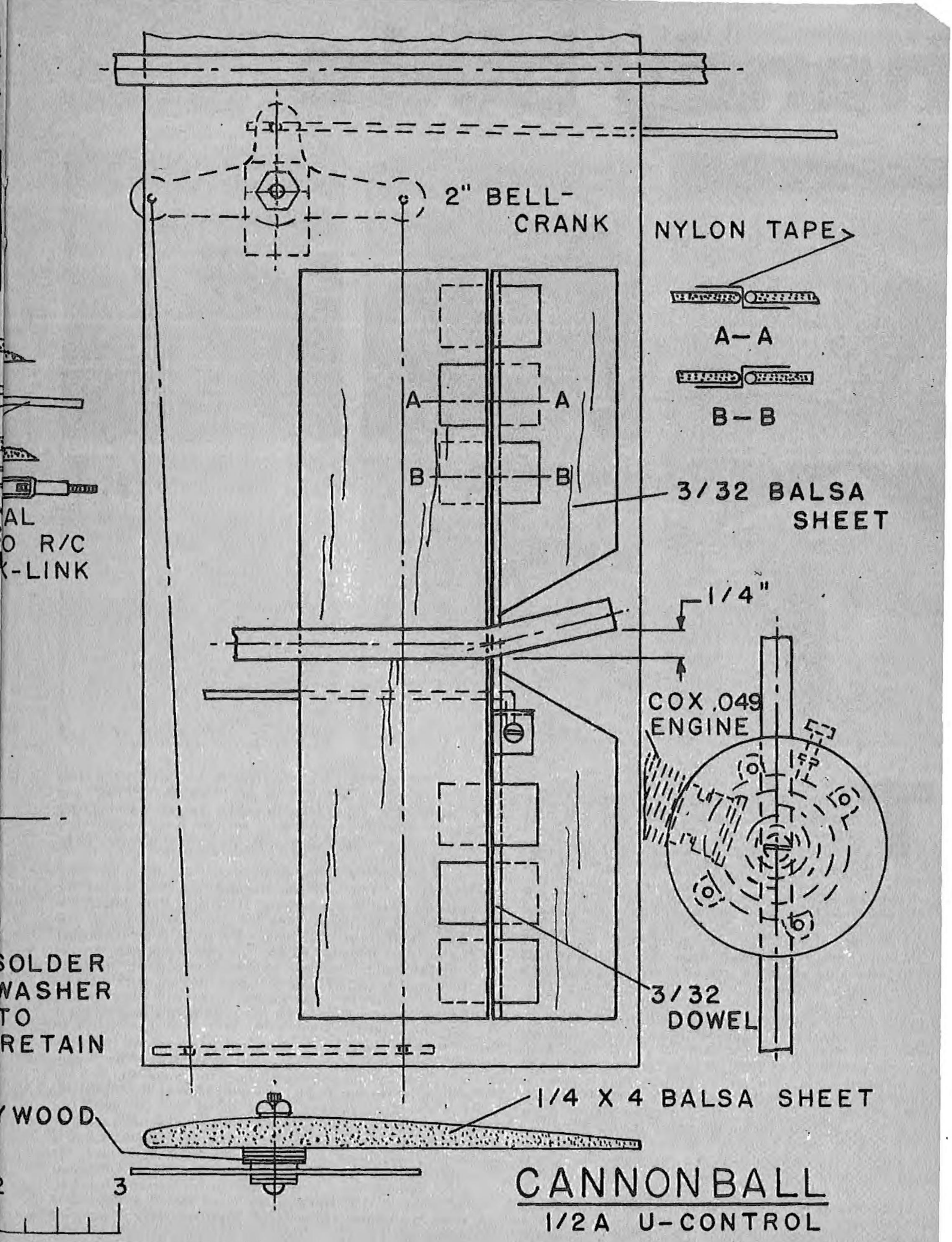
The plane flies great—its lots of fun—its different—and really draws a crowd. I hope you decide to build it.



This .049 powered control-line model may look like a flying pizza but it does as well as any profile.

by PAUL H. SCHAAF, JR.

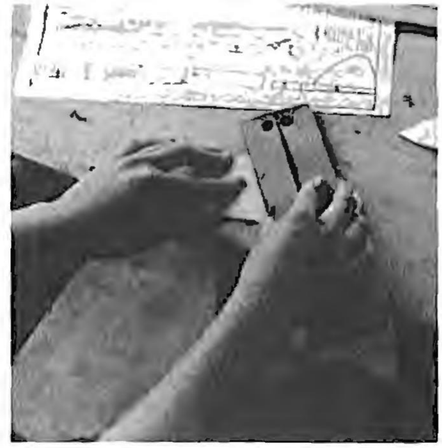

1/8 PLYWOOD
1/16 MUSIC WIRE
OPTION
DU BR
KWI
1/4 BALSA
SHEET
12 DIA
BALSA BLOCKS
C.G.
1/16 PLYWOOD
1/2 SIZE
1/8 PL
DESIGNED BY
PAUL H. SCHAAF JR.
0
1



2" BELL-
CRANK
NYLON TAPE
A—A
B—B
A
A
B
B
3/32 BALSA
SHEET
1/4"
COX .049
ENGINE
3/32
DOWEL
1/4 X 4 BALSA SHEET
CANNONBALL
1/2A U-CONTROL
AL
O R/C
K-LINK
SOLDER
WASHER
TO
RETAIN
WOOD
3

Handy hints

by JAMES A. KLOTH



The most useful tool in my entire workshop is probably a folder containing a variety of types and grades of sandpaper. Sandpaper does more different jobs than any other tool. Correct choice and use of sandpaper is the real secret behind building good-looking models you will be proud to display.

Sandpaper seems to have derived its name by being just that: sand glued to paper. Over the years many changes and improvements have been made, but it is still basically the same type of material: sharp-cornered grains of "something" glued to a paper or paper-like backing. Its uses are to make a rough surface smooth or to change the shape of something by rubbing it with the paper's rough surface. It is the only material which can do these jobs. Use it properly and the results will be most satisfying.

The best source of sandpaper is your local hardware dealer. Look over his stock to find out a little more about the types available. The different colors are the first clue to the different types. The major portion of his stock is ordinary sandpaper, characterized by its traditional brown color. The reddish-colored variety is called Garnet Paper and is the most useful for our purposes. The black is called Wet-or-Dry, and we will discuss it further when dealing with fine finishes. The brownish type with silvery speckles is called Aluminum Oxide or Open Coat Production paper. This is another type which we can make good use of.

There may be two other kinds in the rack: a silvery-blue patterned type called No-Fill and a reddish-brown, very fine grit called Crocus Cloth. These last two are very special types and are not much interest to us. Do not pay too close attention to the terms "Coarse," "Medium," "Fine," and "Extra-Fine." These refer to grades used in working hard woods, which are much harder than the balsa we use. They would be far rougher than what we want if we were to be guided by them.

To choose the proper paper, check the degree of "grit" it contains. The Grit Number describes the size of the particles glued to the backing. The higher the number, the smaller the size particle and the smoother the paper. The lower the number, the rougher the paper and the rougher the job it is intended to do. The higher the number, the smoother the finish it will give. Most important, the softer the wood we will be using it on, the finer the grit should be chosen. Otherwise, the rougher paper will chew up the surface and the part will be too small by the time we get it smooth again.

Now we are ready to choose an assortment of the types and grits which will best suit our needs. The brown sandpaper is "old-fashioned," hard to handle, and not too well suited to our needs, so we'll pass over it completely. The reddish Garnet Paper is better for our use. The roughest grit is usually 100 grit and we'll pick out a sheet or two of it. This looks to be a medium roughness but is actually as coarse as we'll usually need. It is ideal for rough-shaping parts like Hand-Launched Glider wings and other items where a considerable portion of balsa needs to be removed. It is also used to shape the harder pieces of balsa, basswood, spruce, or plywood which we will encounter.

SANDPAPER




Top row, L to R: File folder is excellent for storing and protecting sandpaper—the black sheet is wet-and-dry. Airfoil section is sanded into thick glider wing by using sandpaper block with rotating motion over large areas. Note edge of wing parallel and slightly in from workboard edge. Sand small flat parts with rotating motion; sandpaper rough side up under the work prevents sliding of the wood on the workboard. When sanding ribs use long block covering as many as possible simultaneously. Leading edge of free-flight wing is sanded round with spanwise strokes of block. Bottom row, L to R: For final, smooth sanding of leading edge, hold curled-over scrap of paper in fingers. Large, flat areas—such as fuselage sides—are smoothed with both long strokes with grain and rotary motion if needed. For rounding corners or working on curved surfaces, fold over smaller piece of sandpaper. For built-up, flat tail surfaces, sand evenly but without remaining on one spot. To sand large, finished surfaces fold over small piece of wet-and-dry and use rotary motion.

Skip over the 120 grit Garnet Paper and pick out a couple of sheets of 150 grit. This will be the most frequently used grade and is a general-purpose type for our needs. It is used to shape the softer pieces of balsa and to smooth out the roughness left after shaping something with 100 grit. (The 120 grit does a lot of these same things; but until we get involved with extra-special jobs, we don't need to spend money on it yet.)

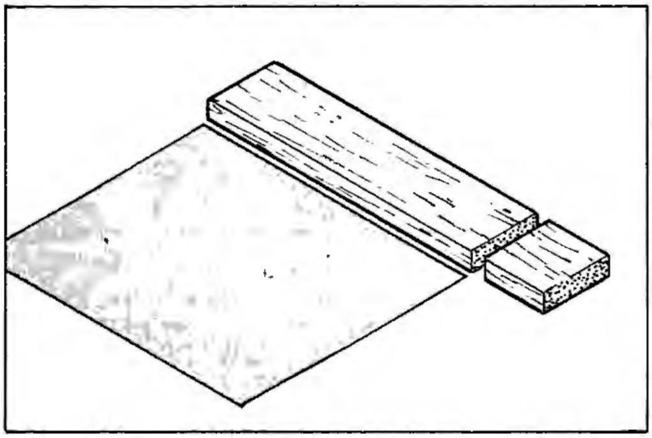
Pick out several sheets of 220 grit Garnet Paper. This will be used to shape and finish most of the balsa parts we will encounter in rubber-powered and small gas-powered Free-Flight models. It is used to finish, shape, and smooth the surfaces of Hand-Launched Gliders and the all-wood parts of small Control-Line models. The rough-shaping is done with the coarser grades like 100 grit, where a lot of material needs to be removed. Some material remains to be removed by the medium 150 grit, as we remove the marks left by the coarse paper. The final shaping with the finer 220 grit takes off the remaining excess wood and leaves us with a nice smooth surface.

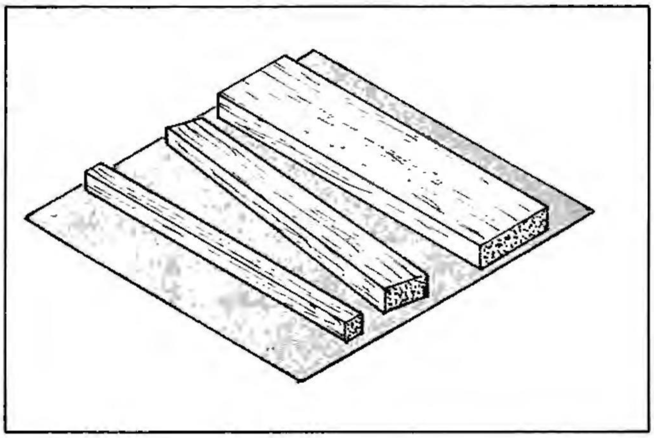
We aren't quite ready for finishing our model, and since 220 is the finest grit usually found in the Garnet paper type, we need to skip over to the Wet-or-Dry type to find the last and finest grit we will need. Wet-or-Dry means just what it says: it can be used wet or dry. The glues used to make the particles of the other types stick to the backing will dissolve in water. The backing material, too, will get all soggy and sloppy when it gets wet, making the paper useless. Wet-or-Dry uses a different glue and a different backing, which are not affected by water. Wet-sanding (dipping the paper in water before sanding) is the way fine finishes are sanded on cars, boats, and furniture. It is also used this way on models, but the wood must all be well sealed first to prevent the wood and glue joints from being damaged by the water. The water, by the way, acts as a lubricant and also keeps the sandpaper dust from clogging the fine pores of the paper.

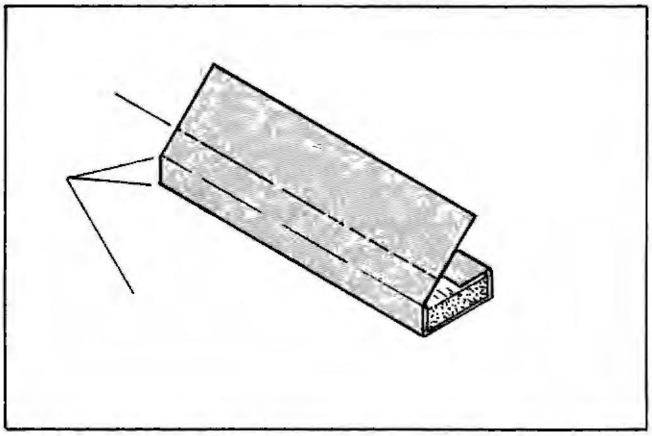
We aren't interested in the wet-sanding process yet, but will use this type of paper for dry-sanding first. Wet-or-Dry paper seems to be the only type available in the very fine grits—the kind we need to properly smooth soft balsa. Wet-or-Dry comes in 180, 220, 320, 400, and 600 grit grades. We will pick out a sheet or two of the 320 and 400 grit for our use. (The 320 is not as important as the 400, so if you want to save a little money, choose just the 400.)

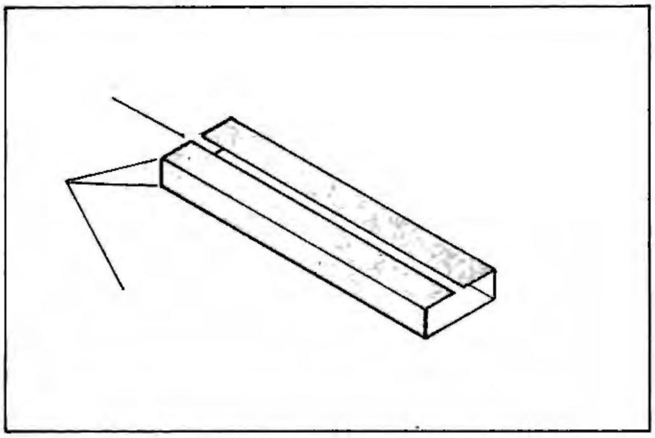
This is the procedure used in the final sanding for all of our surfaces, whether a solid or built-up structure: very lightly sand the surfaces which the covering material will touch on built-up structures; paint these surfaces with a very thin coat of clear dope. The last fine feathers of balsa will become stiff enough to be sanded off, again very lightly with 400 grit paper. Lightweight indoor models will become too heavy if treated this way, but larger outdoor models will benefit from receiving a coat or two of clear dope and being sanded this way. The clear dope will add strength to the balsa and make the covering job easier.

All solid-wood surfaces should be "finish-sanded" with the dry 400 grit, and then painted with a thin coat of clear dope and sanded again. Treating them this way several times will provide a good moisture seal on gliders and









provide a base for a nice finish when followed by a coat of sanding sealer and color dope.

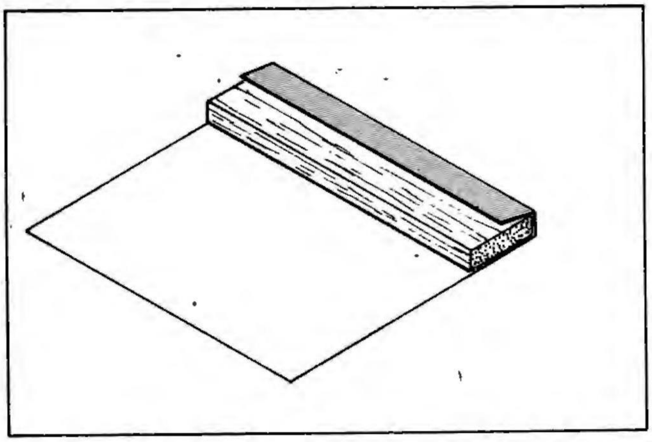
The art of applying fine finishes by proper use of sandpaper is too long to be covered in one article. So, to get you started with your newly purchased tools, we'll go into the basic ways to use sandpaper properly.

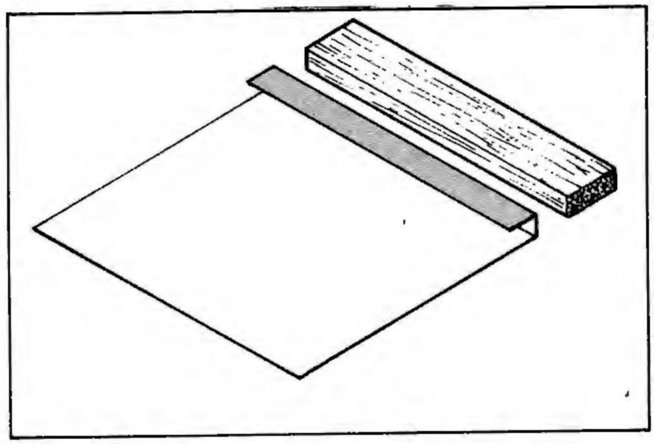
The best way to use sandpaper is by wrapping it around an appropriately-shaped block. Some can get pretty fancy for special jobs, but the simplest and most-used way is around a plain smooth piece of pine. Pick a piece which is two or three times as long as it is wide, and thick enough to be able to hold it easily. One long large surface should be nice and flat and smooth with square and parallel edges. Cut a piece of sandpaper to the length of your block and wide enough to wrap at least around the sides and maybe also around the corners onto the top. Lay the paper face down on a flat surface and center your block in the middle of it. Fold the sides of the paper up along the edges of the block on both sides, so that they wrap closely around the wood. Take the block away and crease the paper sharply along these fold lines. The block should kit snugly between the folded-up sides so it won't slip around when sanding. The paper can then be glued to the block with rubber cement, or the excess width folded around the block on top and held in place with thumb tacks. You must be careful when gluing the paper to the block to avoid getting any lumps of cement between the paper and block on the surfaces which you will be using to sand with. A rough-surface block or one with glue lumps will cause gouges on the balsa you are sanding.

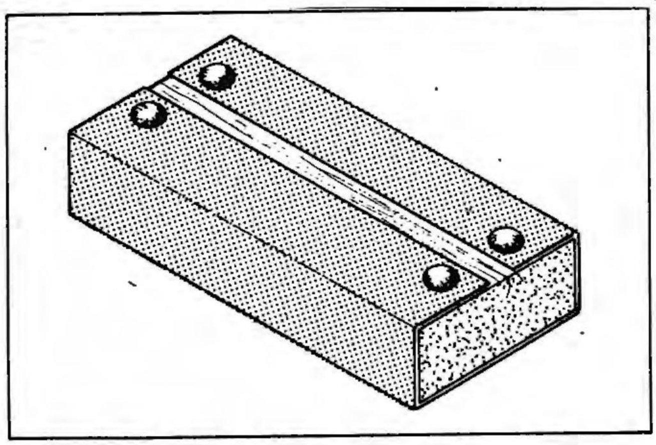
You can also wrap the paper around the block and just hold it in place with your fingers. You must be careful that it doesn't slip when sanding though, or the creased edges will gouge the balsa. It's a good idea to make up several blocks—one for each grit of paper you will use, and replace the paper when it gets worn. You will then have the proper grit block ready to use when you need it, without having to replace the paper each time you need a finer or coarser grit if you have only one block. One good way to do it is to make your blocks as long as the paper is wide. Then make the blocks wide enough so that a sheet of sandpaper divided into thirds or quarters will just fit nicely when wrapped around. Sandpaper is cheap, but not so cheap that you want to have lots of unusable scraps left.

Change the paper on the block when it becomes so worn that it no longer does its job. Save these pieces and cut them into smaller chunks. Fold these in half then to use, with your fingers as the sandpaper block, for tight corners and odd jobs. The whole surface of the paper usually doesn't get worn out on the sanding block, so these scraps will help to save you money.

A selection of the different types of paper mentioned will cost a dollar or two, which you would probably rather spend for another kit or more balsa wood. Your work can only be as good as the tools you use though, so scrimp somewhere else to be sure you have the right grades of paper on hand when you need them. It isn't all that expensive, and will be worth ten times its cost in making your models easier to build, and have them come out nicer looking.







Top row, L to R: A good sandpaper block can be made from a piece of white pine, about three times as long as it is wide. Sandpaper is cut to agree with length of block. Variety of shapes provides blocks for special purposes. Edge of paper first is folded around corners of one side of block. Paper then is removed and the fold lines sharply creased with the fingers. Bottom row, L to R: Repeat the sequence for the other side of the block. Broken line indicates where paper is to be cut, leaving narrow space between the long edges of the sandpaper. Thumbtacks hold paper to block.

The best way to use the sanding block varies with what you are trying to do. When you need to remove lots of material, like shaping a solid-sheet wing to airfoil shape, use the coarser 100 grit across the grain or with a circular motion. Lay the wing on a flat smooth surface near the edge and scrub away. Use the cross-grain strokes to "chew off" stock in a particular area, but work into the rotary motion to blend the sanded surface with areas around it. Move gradually from one area to the next. It is usually best to sand a little off, working from one area to the next until the whole surface is partly done. Then go all over the whole surface again, taking a little more off, repeating this until you are close to the shape you want, but leaving some to be removed with the finer-grit paper. Sneak up to the shape you want gradually, using finer and finer paper. This will keep you from going too far with the coarse paper, ruining the whole sheet of wood. Switch to sanding *with* the grain, along the direction of the wood fibers, as you get close to the final shape you want with the 220 grit. Action should be with the grain or a slight rotary motion again. The idea is to get a smooth surface which blends or flows into the areas around. You are trying for a smooth uninterrupted airflow, so think of how you would like to find it if you were an air molecule slipping over the wing.

The final finish-sanding can be done holding a 3" x 6" piece of 400 grit folded in half in your hand. Grip one corner between your thumb and first finger and let the rest trail out beneath your fingers—they act as a flexible sanding block, which follows your already shaped surface. Extra pressure can be applied by one or more fingers to remove any high spots which show up. Work mostly with the grain but use the slight rotary motion to blend from one area to another.

Lightweight built-up structures—like wings—are sanded only lightly. Use the 220 grit block, spreading the block over as many ribs as possible. Work it from front to back to even up the shape of all ribs. Then switch to a rotary motion to blend the leading and trailing edges into the rib airfoil shape. Again, span as much area as possible to keep all surfaces even. The last rounding of the leading and trailing edges and tips is done with a scrap of 220 or 400 held lightly in the hand, with your fingers curved to get a nice even radius.

Try always to sand with the lightest pressure possible. Use the coarser grits to remove excess material instead of pressing harder with finer grits. Work slowly and carefully, especially as you get closer to the final shape you want. It is heart-breaking to have the block slip and gouge out a chunk and mess up a model now that you have so much time and money invested in it.

You now know the basics of using sandpaper. Starting with these few tips, you can learn by doing. Each of your models will come out a little better than the last. You will need to experiment in order to discover how to shape some of the more intricate parts, but let the basic ideas guide you as you try. Wrap pieces of sandpaper around smaller blocks, dowels, or other odd-shaped things to sand the more complex parts to the proper shape. Soon you will be very proud of your work and able to show it off to others as a good example of your craftsmanship.

One of the most exciting events in the field of motor racing has got to be an attempt at the land record. Exotic cars are brought to courses, such as the Bonneville Salt Flats 14-mile straight-away racecourse in Utah, to try to go faster than anything has ever gone on the ground before. The only judge is the stop watch. The rules are equally simple: just go through the course in each direction within one hour at a speed greater than ever before attained.

Simple? Maybe not so simple after all. It took Gary Gabelich more than 5 days at the Salt Flats in Utah to finally overcome mechanical and technical difficulties and break the record of 600.601 mph which had been held for the preceding 5 years by Craig Breedlove. When he finally succeeded, he had only enough fuel left at the Salt Flats to make three more runs with his natural-gas and hydrogen peroxide-fueled 22,000 lb. thrust engine.

Succeed he did, though. The world's absolute land speed record is now 622.407 mph, established by the car which we have modeled here. It uses a Jetex "150" rocket engine, and can be run on those quiet Sunday mornings when even the birds have to tiptoe around on the roof.

For straight-line tether running, use a length of 50-pound-test monofilament fishing line stretched tightly from a post, parking meter, or some similar structure, about 100 feet long. Drape a large towel over the line about 10 feet from the end to slow down the car, and put an old bed pillow over the line at the post to cushion its final deceleration. Use only one pellet in the motor.

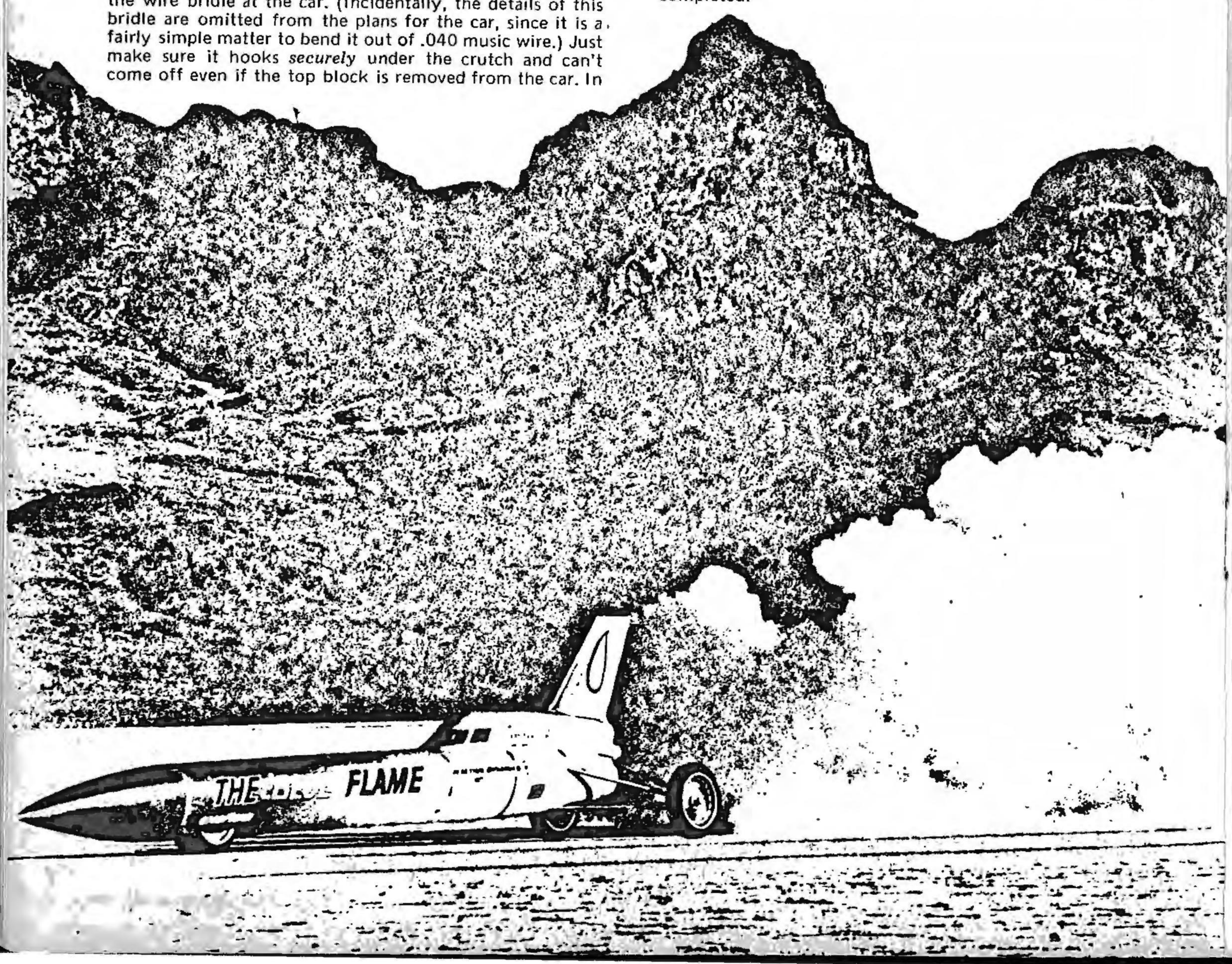
For around-the-pole running find a post or pole in the center of a smoothly-paved flat area. Use at least a 25-foot line of the same material, tied securely to the post and to the wire bridle at the car. (Incidentally, the details of this bridle are omitted from the plans for the car, since it is a fairly simple matter to bend it out of .040 music wire.) Just make sure it hooks *securely* under the crutch and can't come off even if the top block is removed from the car. In around-the-pole running, use as many as three pellets in the motor for extended runs.

We have had only one experience at free-running the car. We were coerced into turning the car loose, running freely with three fuel pellets in the motor, when we visited El Mirage Dry Lake, here in California, in order to take color photos of the car. It went more than one half mile before stopping against a bush, so make sure there is plenty of area available if you try this.

Incidentally, once the **Blue Flame** has been built, try other far-out designs and multi-engined versions. Let your imagination be your guide—the whole idea behind this hobby is to have fun!

CONSTRUCTION: First examine the plans carefully and read over these instructions. The car is built around a ¼" square balsa crutch, so carefully cut the pieces and glue them together over the plans. While the glue is drying, slice two pieces of ½" balsa sheet to 1¼ x 9¼". These will be the body sides. Carve and sand the edges to a 45-degree angle, and cement them firmly to the body crutch. Some material will stick out beyond the sides of the crutch, as indicated by the dotted lines on the plan, but this excess will be removed when the body is shaped to the final tear-drop cross-section.

When all these glue joints have dried, remove the assembly from the plans and glue the nose-block firmly in place. Use a good strong Alephatic glue or epoxy for this joint, as it will take a lot of punishment. Finally, the top plate, of *firm* 3/8" sheet, is spot-glued to the crutch with model airplane cement. Don't use too much glue, because this plate will have to be removed after the body painting is completed.



Now for the fun and games! First, rough-carve the body to the approximate cross-section shown. Use a *sharp* knife, since a dull blade requires extra pressure, and can therefore slip more easily. One of the problems in modeling a car comes when the body sides must be sanded—because the long sides must be flat, with no waviness apparent. To accomplish this, we borrow a page from the machinist's shop and build a small "surface table." Machinists use a large, flat surface of heavy steel to check the flatness of machined parts. We use a large piece of No. 280 sandpaper wrapped around a scrap piece of heavy, thick glass (obtained from a hardware store's remant glass bin for 50 cents) to sand the body without inducing these distracting hills and dales. Use the "Poor Man's Surface Table" for all but the final rounding of the nose block.

After the body's main assembly has been shaped on the surface block, smooth-sand it with No. 400 sandpaper, dust it carefully with a dry rag, and lay it aside.

Cut the 1/16" plywood engine base with a coping saw or hacksaw, and glue it securely to the base of the 1/2 x 3/4" cabin. Shape this to the same outline as shown on the plans, and sand it on the same surface table, then glue the whole assembly to the body. Using No. 400 sandpaper, touch up the whole assembly again and dust it thoroughly.

Now the body can be painted. The following is not the only way to paint the body, but worked well for the author. If you know a better technique use it, but if not then try this. Apply two coats of automobile primer, light gray, and allow to dry completely. Sand these two coats almost completely off, then apply two more coats of primer. By now surface should be waterproof, so wet-sand the body this time using No. 400 sandpaper first, and then No. 600, wet-or-dry sandpaper. Wet-sanding may be new to you in model building, so let's take a look at it.

First, the main reason for wet-sanding is to keep the abrasive on the paper from clogging. Have a source of running water nearby. The author uses the kitchen sink for this, and the material sanded from the body runs down the sink without any clogging problems. Wet the paper, and then sand lightly until the paper stops cutting. With a little practice this feel will be apparent. Immerse the work and the paper briefly under the running water, and the paper will start cutting again as the paint washes away from it. Don't apply too much pressure, as the sandpaper cuts almost twice as fast wet as it does dry, and care must be taken not to cut through the paint, or the wood will get wet and will have to be dried completely before it can be color-painted.

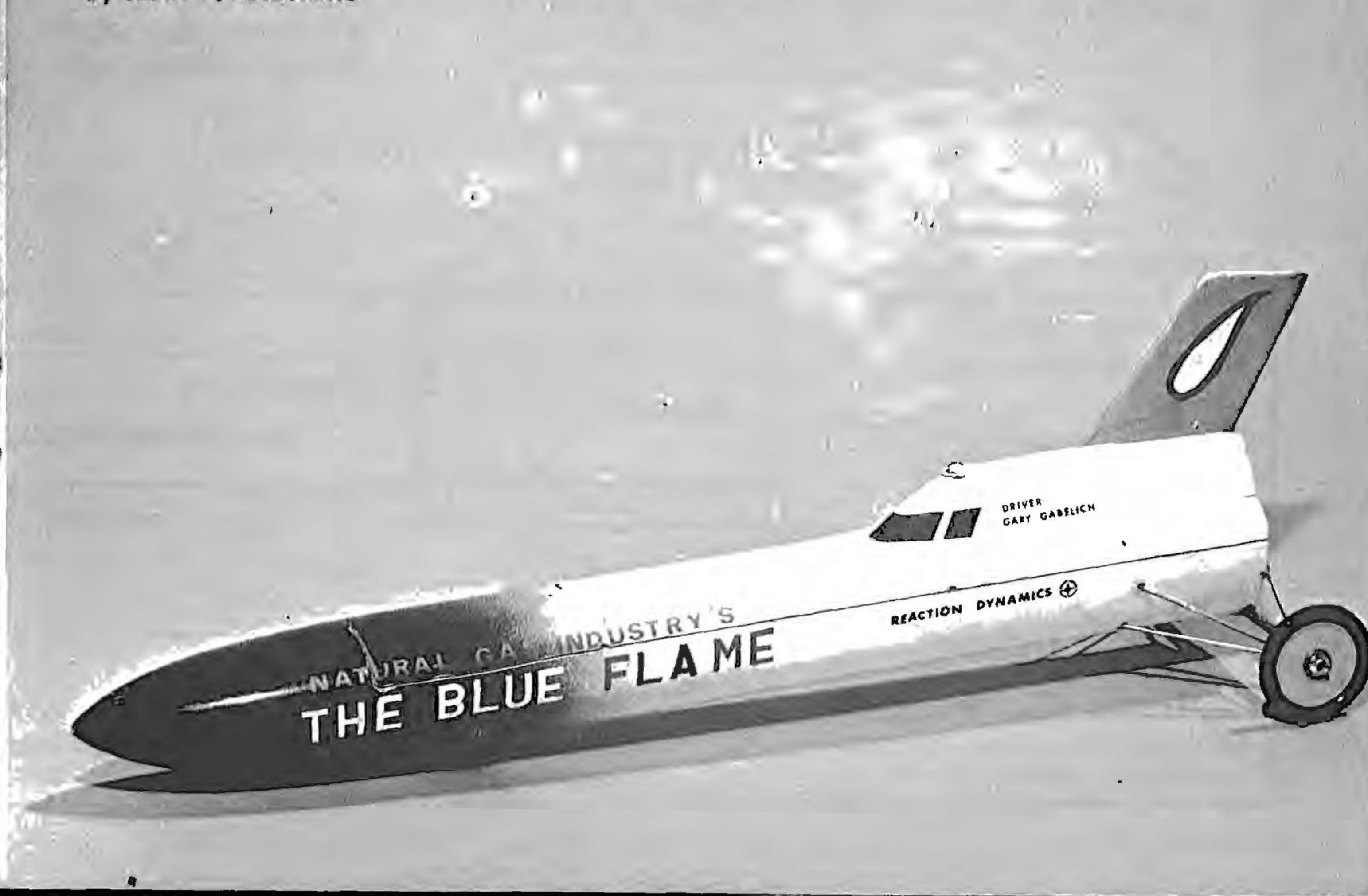
We used a spray can of "Appliance White" for the base color coat. Apply one thin coat, allow it to dry completely, and apply a second coat. When this has dried, again sand lightly with the No. 600 sandpaper (wet). Two more coats are applied in the same manner and lightly dry-sanded.

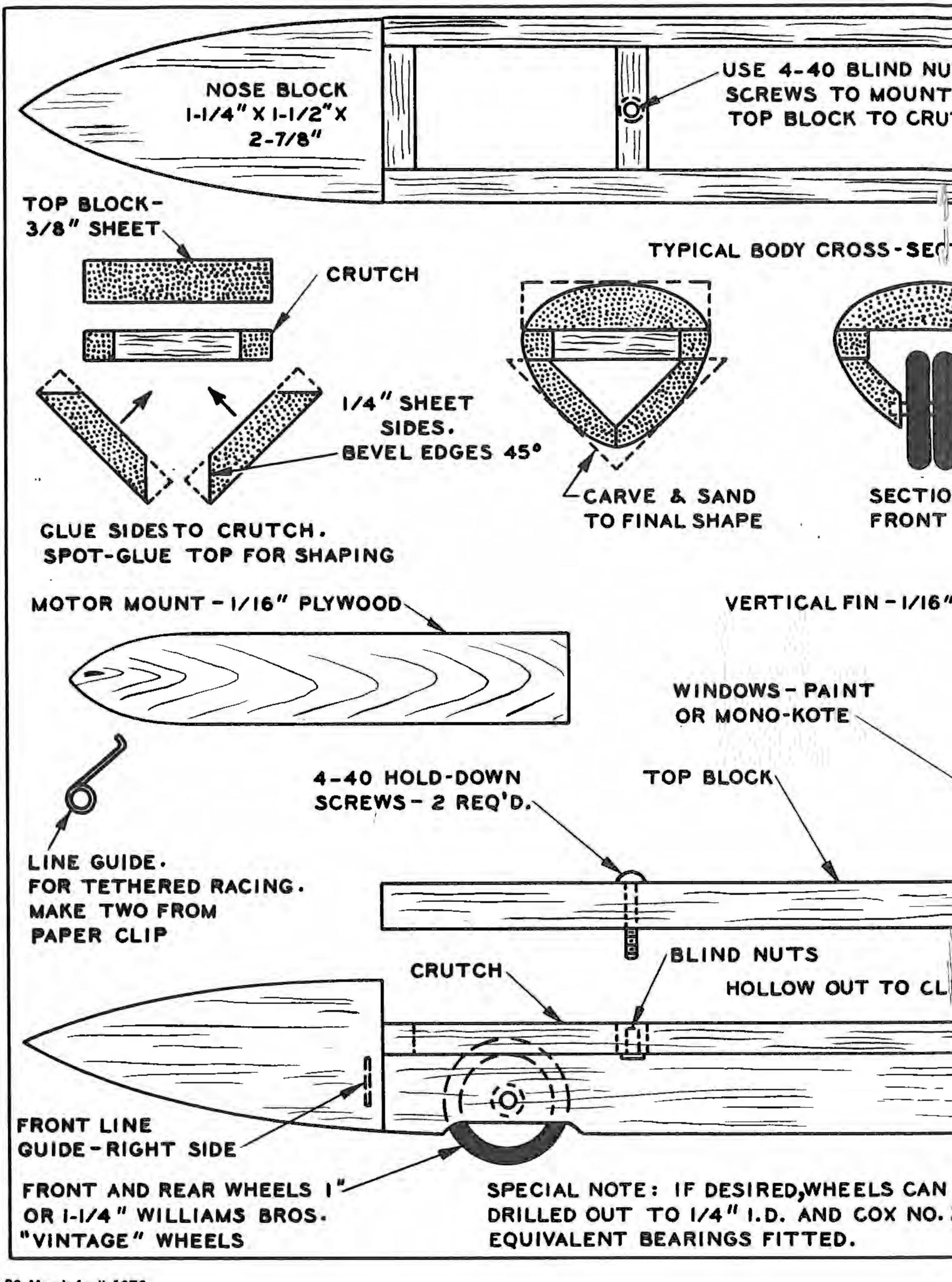
The nose-cone is faded from dark blue at the tip, and disappears just behind the front wheel well. The author accomplished this by holding the body about eighteen inches from the can of dark blue spray paint, and rotating the body smoothly while spraying at the tip of the nose. If the color doesn't come far enough up the body carefully adjust the paint stream direction to allow the paint to alight further back along the body. With a minimum of care the effect can be very striking.

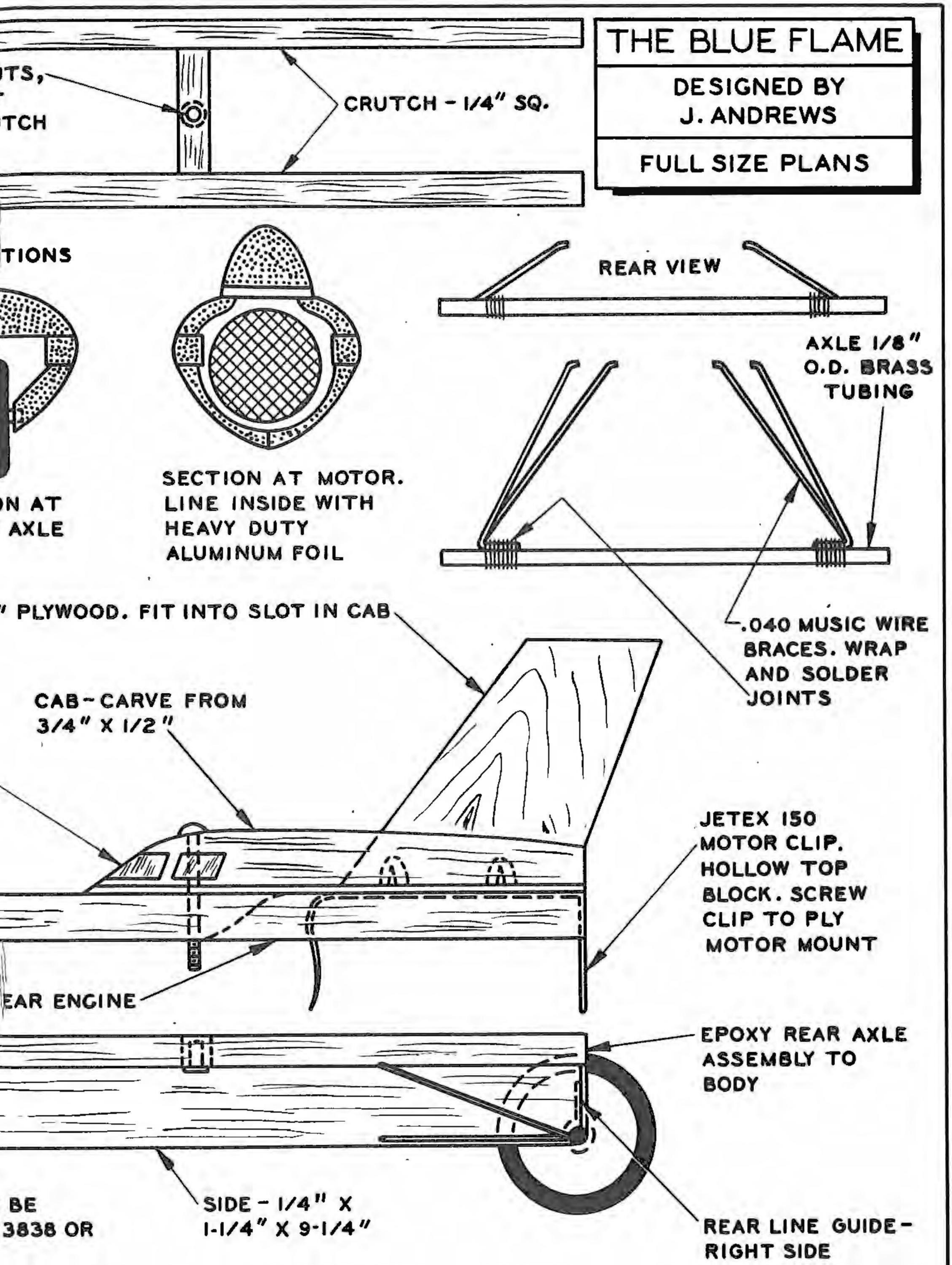
Now allow the paint to dry fully, while the wheels and axles are assembled. The author used 1" Williams Brothers

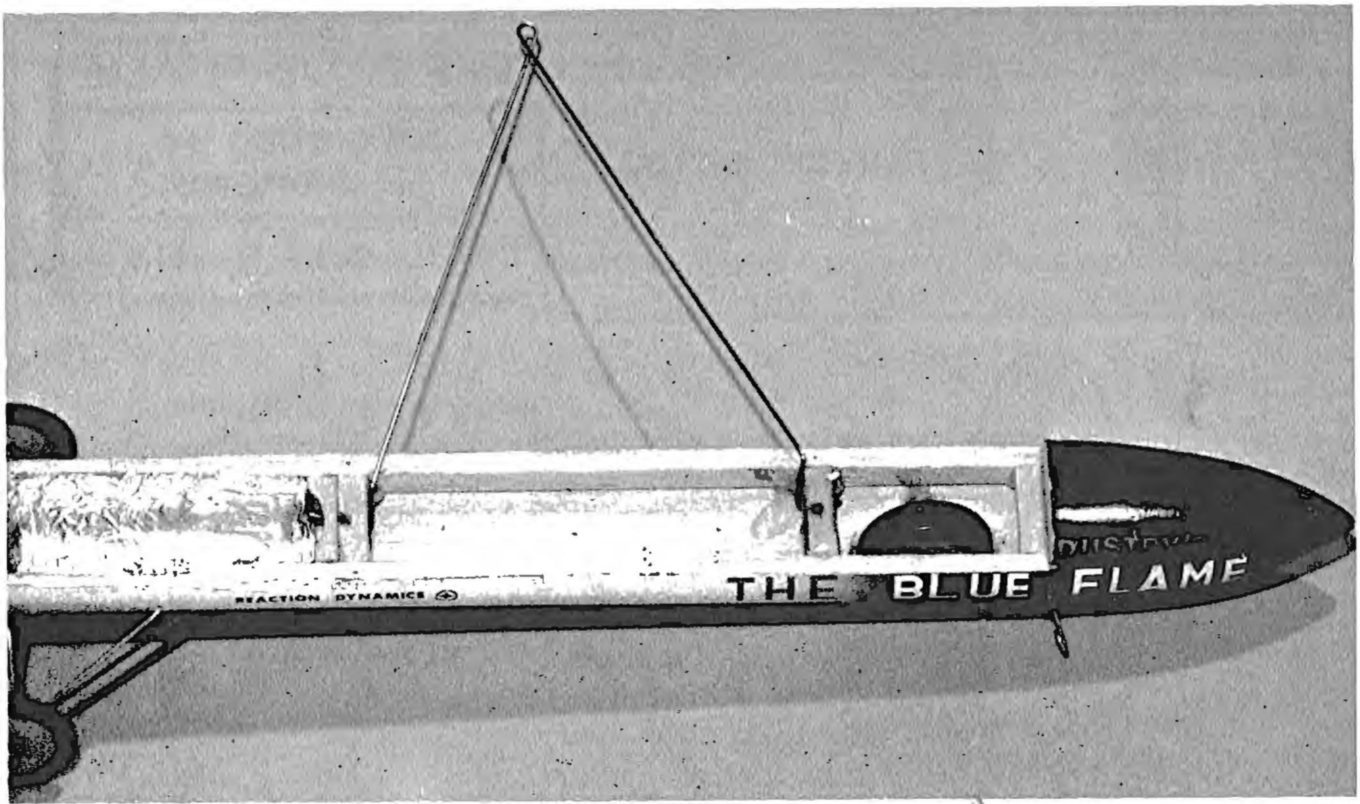
The Blue Flame

by JEAN F. ANDREWS




NOSE BLOCK
1-1/4" X 1-1/2" X
2-7/8"
USE 4-40 BLIND NU
SCREWS TO MOUNT
TOP BLOCK TO CRU
TOP BLOCK-
3/8" SHEET
TYPICAL BODY CROSS-SEC
CRUTCH
1/4" SHEET
SIDES.
BEVEL EDGES 45°
CARVE & SAND
TO FINAL SHAPE
SECTIO
FRONT
GLUE SIDES TO CRUTCH.
SPOT-GLUE TOP FOR SHAPING
MOTOR MOUNT - 1/16" PLYWOOD
VERTICAL FIN - 1/16"
WINDOWS - PAINT
OR MONO-KOTE
4-40 HOLD-DOWN
SCREWS - 2 REQ'D.
TOP BLOCK
LINE GUIDE.
FOR TETHERED RACING.
MAKE TWO FROM
PAPER CLIP
BLIND NUTS
CRUTCH
HOLLOW OUT TO CL
FRONT LINE
GUIDE-RIGHT SIDE
FRONT AND REAR WHEELS 1"
OR 1-1/4" WILLIAMS BROS.
"VINTAGE" WHEELS
SPECIAL NOTE: IF DESIRED,WHEELS CAN
DRILLED OUT TO 1/4" I.D. AND COX NO.
EQUIVALENT BEARINGS FITTED.


THE BLUE FLAME
DESIGNED BY
J. ANDREWS
FULL SIZE PLANS
CRUTCH - 1/4" SQ.
REAR VIEW
AXLE 1/8" O.D. BRASS TUBING
SECTION AT MOTOR. LINE INSIDE WITH HEAVY DUTY ALUMINUM FOIL
PLYWOOD. FIT INTO SLOT IN CAB
.040 MUSIC WIRE BRACES. WRAP AND SOLDER JOINTS
CAB - CARVE FROM 3/4" X 1/2"
JETEX 150 MOTOR CLIP. HOLLOW TOP BLOCK. SCREW CLIP TO PLY MOTOR MOUNT
EPOXY REAR AXLE ASSEMBLY TO BODY
SIDE - 1/4" X 1-1/4" X 9-1/4"
REAR LINE GUIDE - RIGHT SIDE



Tether for circle running around a pole is bent from .040 wire and hooks under crutch. Photos these two pages by Norton, Anaheim.

Vintage Wheels for the front, and 1¼" Vintage wheels for the rear, mounted backward on the axles. Drill out the centers of the wheels to ¼" diameter and fit Cox No. 3838 or equivalent slot-car roller bearings. These are not absolutely required, but help top speed immensely. Press these bearings into the wheels with a vise or a large pair of pliers to assure they are lined up correctly.

The front axle is made from a short piece of 1/8" outside diameter (O.D.) brass tubing. Cut it by filing a shallow groove all the way around the tube and then breaking it at the notch. Slide the wheels onto the axle, and solder 1/8" inside diameter (I.D.) brass washers on each side of the wheels. Use low heat electronic solder, and don't get the bearings any hotter than possible or the grease will melt out of them, requiring constant re-oiling.

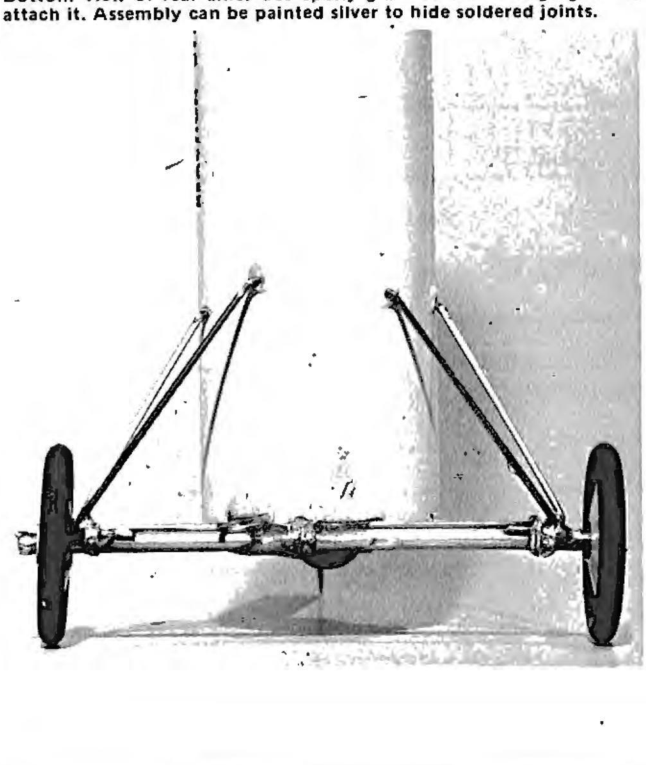
Cut the rear axle of brass tubing, and cut and bend all axle braces to shape directly over the plans, from .040 music wire. These braces are functional, lending considerable strength to the axle assembly, so do not omit them.

Use alligator clips to hold these pieces together while they are wrapped with light copper wire and soldered. Fit the rear wheels to the axles, again using care to avoid overheating the bearings.

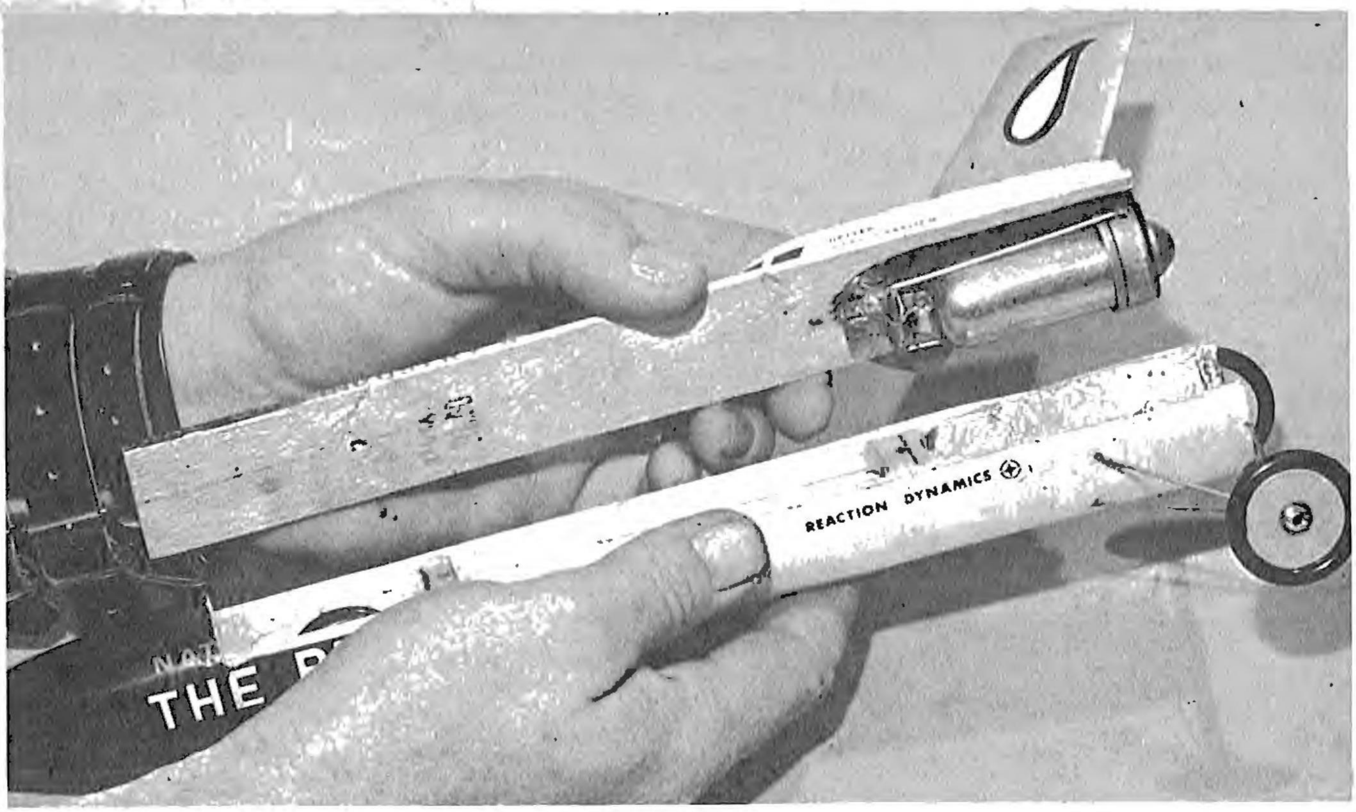
By this time the paint on the body should be dry enough to apply whatever lettering you desire. The author used a 1/72-scale German I.D. decal for the large letters on the sides of the car, and 1/16" and 5/32" Letra-sets for the small lettering on the driver's cab and the sides. Incidentally, this type of "dry transfer" lettering is easy and adds a lot to the model's realism. This model shows our first attempt at using these letters, and they came out quite good.

After detailing the body, cut a small notch at the lower aft end of the body and fit the rear axle to the body, using epoxy glue for all attach points. When the glue has set up, carefully cut away the top of the car along the spot-glued seam. Push in along the seam with a very sharp razor or knife, to avoid breaking the paint away and making the seam more noticeable on the finished car.

Position the front axle assembly inside the car and cut out the front wheel well. If the axle threatens to come through the tapered sides of the car when lowered far enough to make the wheels protrude under the car, shorten the axle with a file. Epoxy the front axle in place, at a

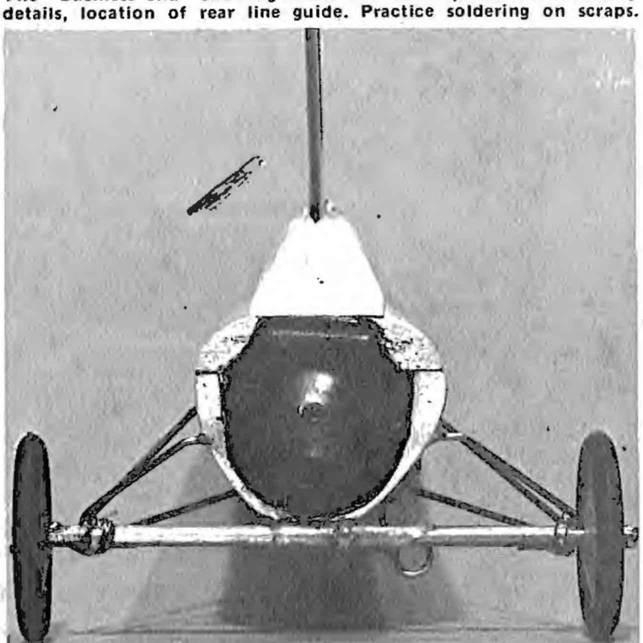


Bottom view of rear axle. Use epoxy glue—or other tough glue—to attach it. Assembly can be painted silver to hide soldered joints.



Jetex 150 motor mounts to top block, then two 4-40 screws and blind nuts hold top block to crutch. Keep motor clean for best results.

The "business end" showing Jetex 150 nozzle, rear axle assembly details, location of rear line guide. Practice soldering on scraps.



position that allows the car to sit in a slightly nose-down attitude, and make sure the wheels are straight so the car will track true.

Hollow out the rear of the car to fit the Jetex "150." The author used a piece of No. 150 sandpaper wrapped around a file handle of the correct diameter to make it easier. Also cut out the inside of the top block to fit the Jetex mounting clip. Be sure the engine has at least 1/8" clearance all around, then line the entire inside engine compartment with heavy duty aluminum "Broiling Foil" to dissipate the heat generated.

Drill out the top block and the crosspieces in the crutch, and epoxy the blind nuts under the crosspieces. If it is necessary to cut one of the 4-40 screws down, put one of the nuts on the screw first. Cut the screw with a hacksaw or a pair of wire-cutters, then file the cut end to a blunt point and wind the nut back and forth over the cut portion to re-new the threads roughened by cutting.

Cut the plywood fin and sand it to knife-edge sharpness with a hardwood sanding block and No. 150 and then No. 280 sandpaper. Apply one coat of auto primer, sand it smooth, and paint it silver.

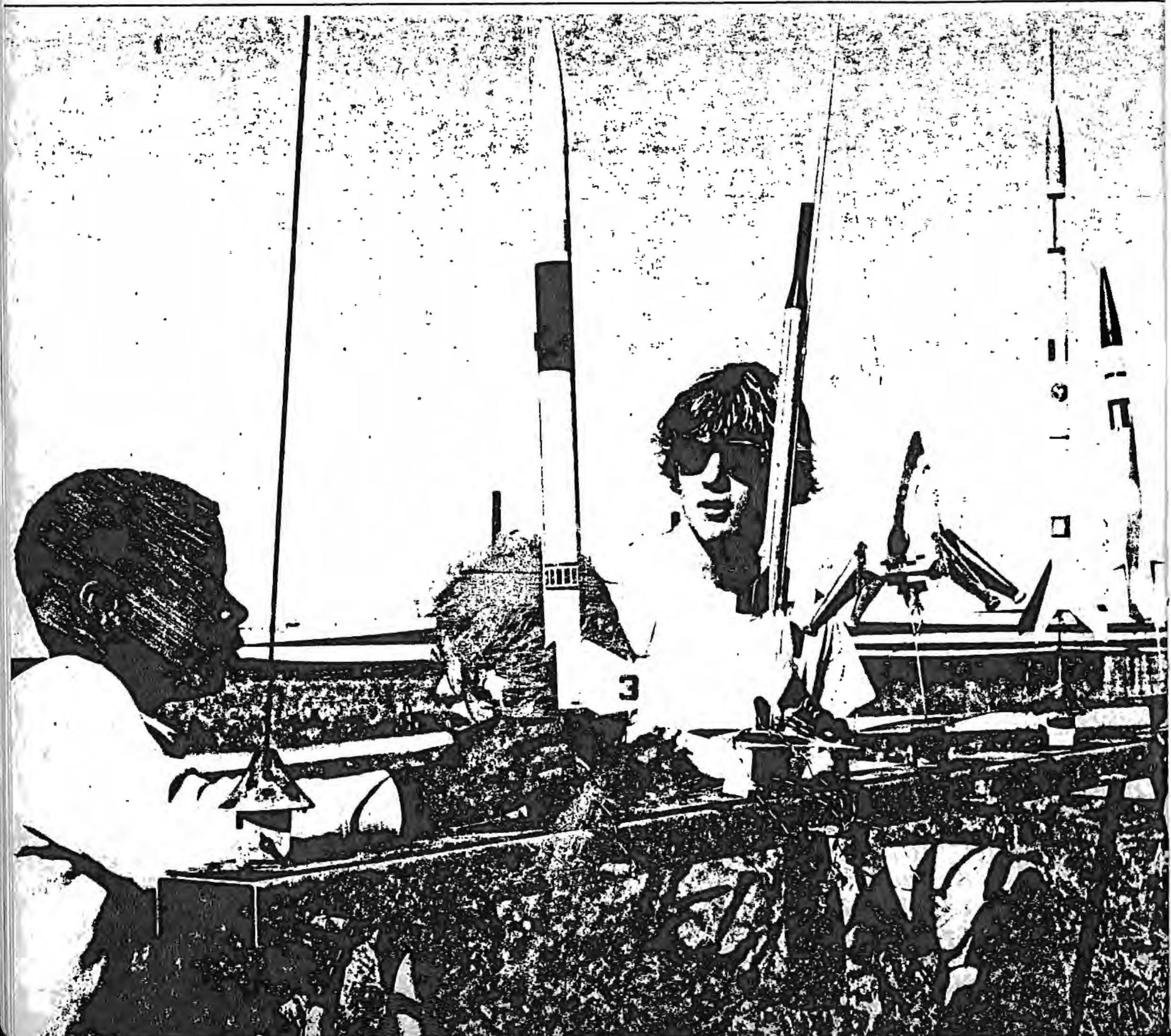
Cut a notch in the cabin roof extending down to the plywood engine mounting plate, and glue the fin in place in this groove. The windows on the cab and the flame insignia on the vertical fin of the original model were cut from scrap blue Mono-Kote. Make a pattern for the windows before cutting the Mono-Kote to make sure they fit properly. These details can be painted on if desired.

That's about it. One last word, though: follow the instructions which come with the Jetex carefully, and keep the engine's interior spotlessly clean by scraping the residue from inside the casing after each run. Allow the motor to cool completely between runs and before handling, of course. Also, we have seen Jetex users fail to remove the fuse from the orifice at the back of the engine after fuel combustion has begun, on the theory that the copper fuse wire will melt and blow out without help. *Always* remove this wire! The exhaust gas temperature is not hot enough to burn. Failure to remove the wire may clog the jet orifice. This may burn out the gaskets, and puts an unnecessary load on the engine mounting clip.

In closing, the author wishes to thank Gary Gabelich and Bob Kaschler for their help in the completion of this project.

MODROC engines

by STEPHEN S. FENTRESS



Chances are that you have read about model rockets in the last two issues of JAM, or have seen them in hobby shops. If you are interested enough to consider taking up rocketry, you will need to be familiar with some of the fundamentals of the sport.

Basically, a typical model rocket is a small (4 inches to 4 feet long) vehicle made of cardboard tubing, plastic, and balsa. It is propelled by a super-reliable, inexpensive solid-fuel motor (or "engine") that you buy complete, fire once, and throw away. The motor is ignited by an electrical system connected to a nichrome wire igniter that works like the heating element in an electric toaster. A small tube glued to the side of the model slides along a 3-foot rail that constitutes a rocket launcher. As the model is launched, the propellant charge in the motor burns for about one second or less, accelerating the rocket to 100 to 400 mph, straight up. After coasting for a few seconds to its peak altitude of 200 to 2000 feet, a parachute made of plastic sheeting (similar to the stuff used in "Baggies") is popped out of the front of the rocket by a small charge in the engine. The model descends slowly and is ready to fly again with the installation of a new engine.

Of course, "modrocs" can be more elaborate than this. They can have two or three stages; or carry cameras, electronic instruments, or eggs; they can convert into gliders for their descent; or they may approach the speed of sound. But they all use safe, pre-manufactured engines and all are equipped with parachutes or other safe recovery devices.

To get started in model rocketry you will want some general background information. One of the best sources for this is the catalogs published by the manufacturers of model rocket equipment, several of which advertise in model magazines. (Include 25 cents when you request their catalogs by mail.) I would suggest starting with Centuri Engineering Co., the L. M. Cox Co., or Estes Industries, Inc., since these firms carry a lot of literature and equipment specifically designed for beginning rocketeers. The standard source for basic information on almost all facets of model rocketry is the excellent *Handbook of Model Rocketry* by G. Harry Stine, a pioneer in the model rocket hobby. Copies of this book are in many school and public libraries; a third edition, recently published by Follett Publishing Co., may be available at your library or a nearby bookstore.

A few words about safety are in order here. It should be emphasized that the user of a model rocket engine never needs to handle dangerous chemicals and never faces any danger at all if he does not tamper with the engines and treats them with reasonable care. Since their invention in the late 1950's, about 24 million model rocket engines have been flown without injury to anybody. This unimpeachable record has been established because each rocketeer has kept safety foremost in his mind and has recognized his responsibility to keep the record perfect.

If you are under 21, and especially if you are under 18, get together with an adult who can assist with and supervise your rocket activities. *(The average age of a rocketeer is 14-16 — Editor.)* This is specifically required in the laws of some states. An ideal plan is to join a club near you (if there is one) which has an adult advisor.

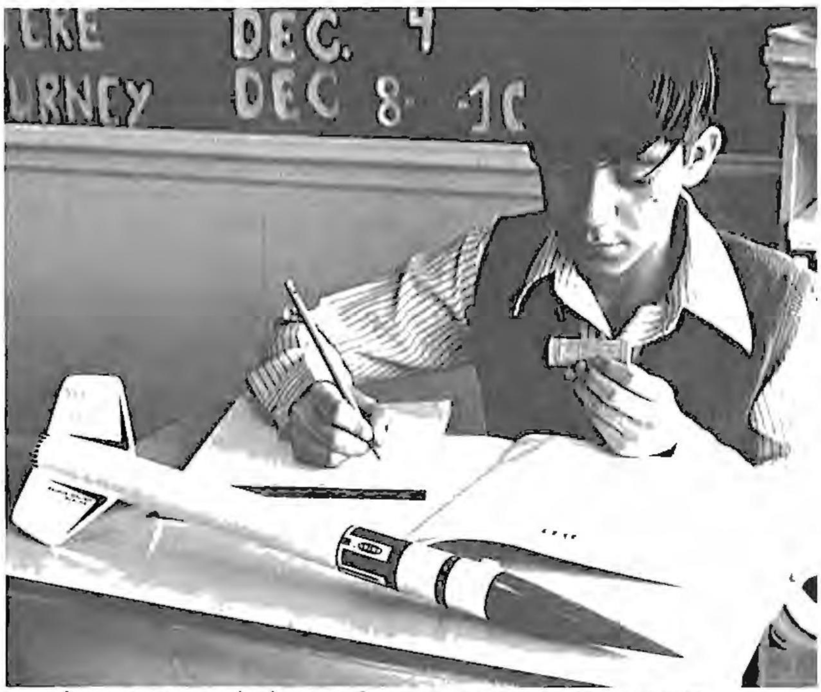
Have your adult advisor check up on the local, county, and state regulations concerning model rockets in your area. A fire department offical or a reputable hobby dealer can usually supply the exact information you need. Needless to say, you should always obey the laws pertaining to rocketry in your area. It will pay you well as a rocketeer to maintain a good relationship with fire safety authorities.

Read and abide by the Model Rocket Safety Code. This Code has been developed and promoted by the Hobby Industries Association of America (HIAA) and the National Association of Rocketry (which will be described at greater length at the end of this article) and can be found in the catalogs of the three modroc manufacturers named above. You will see that the Safety Code is a collection of simple, common-sense guidelines designed to avoid trouble. Follow the Code, keep cool and reasonable, and you will have no need for worry about the well-being of yourself or anyone else.

One stipulation of the Safety Code is that you use only pre-manufactured, pre-loaded model rocket engines. These motors are the heart of the whole hobby, so they certainly deserve closer examination.

The basic purpose of any rocket engine is to eject gaseous material through a nozzle at high speed in order to produce a reaction force, and model rocket engines work the same way. A typical motor has an outer casing made of tightly wound and glued paper, which is very strong and lightweight. (It doesn't burn, by the way.) At one end of the casing is the ceramic nozzle is the solid propellant charge, which burns from the nozzle end forward to provide the actual push needed to move the rocket through the air. Next in line is the slow-burning delay charge, which takes up time while the fast-moving rocket slows down and reaches peak altitude, and generates smoke to help observers see the flying rocket. After the delay has run out, the ejection charge goes off, pressurizing the front of the rocket to push out a parachute or in some other way activate a recovery mechanism. Each charge is loaded directly on top of the last; during the operation of the motor, the flame front moves right on through, igniting each charge automatically.

The basic functions just described can be accomplished by a wide variety of rocket engine designs. When you select a motor, you can choose from engines having many different characteristics.



Using Estes TR-10 Tech Report, rocketeer determines how high Cherokee D will go on D engine. Report contains variety of handy data.

The primary differences between rocket engines are in the propellant charges and how they operate. In order to lift your rocket, an engine produces a certain amount of push, or *thrust*, for a certain amount of time, called the *thrust duration*. Thrust is measured in newtons—the metric system's unit of force—and thrust duration is measured in seconds. Now, it is easy to see that a motor giving high thrust for a long time will lift a rocket higher than a motor producing the same thrust for a short time. But, an engine that produces a very low thrust, but works for a very long period of time, might also lift a rocket to a considerable altitude! All this might be quite confusing to us modelers were it not for a very convenient rocket measurement called *total impulse*. An engine's total impulse value takes both thrust and duration into account, and is measured in *newton-seconds*. All model rocket motors are classified according to their total impulse values, and each category has a letter code as shown below:

Code	Total Impulse in Newton-Seconds
1/4A	0.00 - 0.625
1/2A	0.626- 1.25
A	1.26 - 2.50
B	2.51 - 5.00
C	5.01 -10.00
D	10.01 -20.00
E	20.01 -40.00
F	40.01 -80.00.

The least expensive and most commonly used types are the low and medium impulse engines, classes 1/4A through C.

These letter designations are a quick method of judging the overall capabilities of different engines, but in order to pick the right engine for a specific job, you will need information about some of the engine's other characteristics. The most important performance information for each engine is conveyed by a handy letter-and-number code, such as A8-3 or C6-5—every engine code number consists of a letter, followed by a number, a dash, and another number.

(The letter, as you might have guessed, is the engine's total impulse category.)

The number after the impulse letter denotes the engine's *average thrust* in newtons. This is a mathematically computed value somewhere between the highest and lowest thrust levels given by the motor during its operation. An average value is needed because the thrust is designed to vary in a definite way during the propellant burn, so it would be impossible to name one single thrust level for a given engine. The average thrust figure tells you roughly whether an engine produces high thrust for a short time or low thrust for a long time in giving a certain total impulse. (For example: an A8 engine gives an average thrust of 8 newtons, but burns for only .32 second, while an A5 gives only 5 newtons, but burns for .50 second. The total impulse comes out the same for both, but the average thrust measurement tells which one has the shorter burning time.)

The figure after the dash indicates the delay, in seconds, that the delay charge provides between the end of the thrust phase and ejection. Some engines have a zero in the delay-time position (like A8-0, or B6-0); these are used only in the lower stages of multi-stage rockets, and they have no delay or ejection charges. I would recommend that beginners stick with single-stage jobs for a while, since multi-staging can be a little complicated.

With several average thrusts and delay times available within each total-impulse category, you have a lot of engines to choose from. Just a few of the class A engines on the market today are: A5-2, A5-4, A6-2, A6-4, A8-3, and A8-5! How is a rocketeer to learn which of these six motors to use in a given situation? Actually, experience is the best and fastest teacher, but I can give the following general recommendations:

Most of your rocket flying will be done with engines in the 1/2A through C classes. The 1/2A's and A's are inexpensive enough for frequent flying, and the B's and C's will probably give all the lifting power and altitude you can use, unless you have an especially large flying area, like 4 or 5 miles on a side. A light rocket with a big parachute can drift for miles.

Low average thrust (3-5 newtons)—This is good for a slow, easy-to-see liftoff and for delicate models. However, the long engine burn gives lots of time for wind to deflect the rocket.

High average thrust (6-8 newtons)—This gives a quick, clean takeoff and straight ascent that is relatively insensitive to breezes.

Short time delays (1-3 seconds)—These are used mostly with heavy rockets (2.5 - 5 oz. liftoff weight) to make sure that the recovery system is deployed while the rocket is still well up in the air. Use of too long a delay on a heavy rocket may result in ejection occurring after the rocket has hit the ground—which is to be avoided.

Long time delays (4-7 seconds)—These should be used with caution. If in doubt, use a short delay first, to avoid a crash. Some tiny, light rockets can use 6 or 7 second delays to advantage, provided you have lots of space and good eyesight.

The B14 engines by Estes and Centuri are good load-lifters. They kick even 4 or 5 oz. rockets into the air fast. (Great in winds also.)

The B4-2, C6-3, B6-2, and C6-2 engines are excellent for heavy and/or bulky rockets and many kinds of experimental jobs. They have plenty of lifting capability, while the short delays help insure safe recovery.

Once you have selected the right engine for a certain job, you must mount it in the rocket and ignite it properly before it will work for you.

All model rocket engines are designed to slide into a tube in the rear part (usually) of the rocket body. The standard Centuri, Cox, and Estes engines (up to and including class C) will make a slide fit in the Estes BT-20 or BT-30, or Centuri Series 7 body tubes. (Cox models have special built-in motor mounts, because they are assembled entirely at the factory.) If the main rocket body is larger than the engine tube, some kind of adapter made of cardboard rings or tubes is used to hold the engine tube in position. An example of this is shown in the "Engine Mountings" diagram.

The engine tube always has some kind of mechanical stop, called an engine block or thrust ring, which is glued to the tube and keeps the engine from moving forward in the rocket body. You should be able to push an engine into your models with a force of several pounds without moving the engine block to be sure that the engine will not fly through the rocket when it's operating. It is also important to check that the engine cannot move backward in the rocket when several pounds' force is applied, otherwise the pressure of the ejection gases might eject the engine rather than the parachute. Usually this is prevented by winding the engine casing with masking tape until it makes a tight fit in its tube (but not so tight that the engine can't be removed with a strong pull). The inconvenience of this method has prompted many rocketeers to use a small metal spring clip which retains the engine both at the front and at the back. Many rocket kits use this type of mount. You can also buy the clips separately from Estes or Centuri.

Some rockets use special recovery systems that require the engine to be ejected from the model. In such cases, follow the directions in the kit or on the plans for mounting the engine.

The most common mistakes in model rocketry must be those relating to ignition failure. Rocket engine igniters, like the engine themselves, are only used once, and several different types are available, depending on whose engines you use. (Manufacturers supply igniters with all their engines.) But all igniters work on the same principle: electric current is put through a high-resistance wire to produce heat, which is used to ignite the engine. All of them use 6 to 12 volts from a battery and a simple switch circuit. Although each manufacturer provides directions for using his igniters, a few general suggestions can be made.

1—Make sure the igniter is pushed all the way into the engine nozzle. It must touch the propellant to work.

2—Keep the electrical contacts between the firing circuit and igniter (the micro-clips that grasp the igniter leads) clean and shiny with fine sandpaper.

3—Use a big battery. It's usually very easy to hook into a car battery at the firing range. This gives plenty of juice and the drain on a car battery from launching rockets is negligible. A big 6 or 12 volt lantern battery also works well.

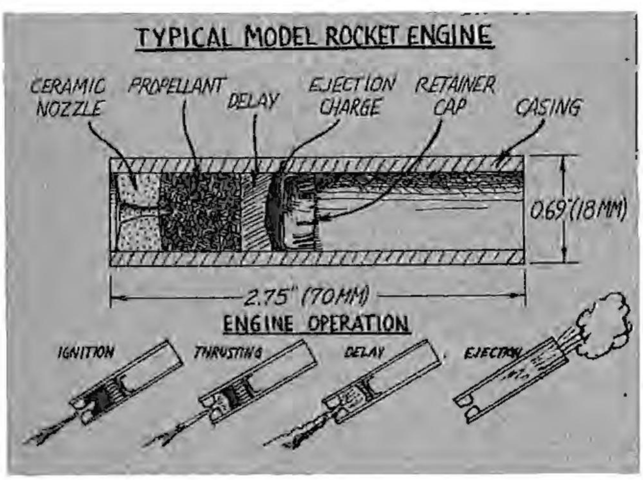
4—If you have a "misfire" (that means you push the firing button and the rocket never takes off), disconnect the battery, then go up and check to see whether or not the igniter heated up or burned. If not, the problem is with your firing system. If the igniter did work but the engine didn't start, the igniter was not pushed all the way into the nozzle. Remove the old igniter, gently scrape the soot off the propellant with a straight pin or piece of wire, install a new igniter and try again.

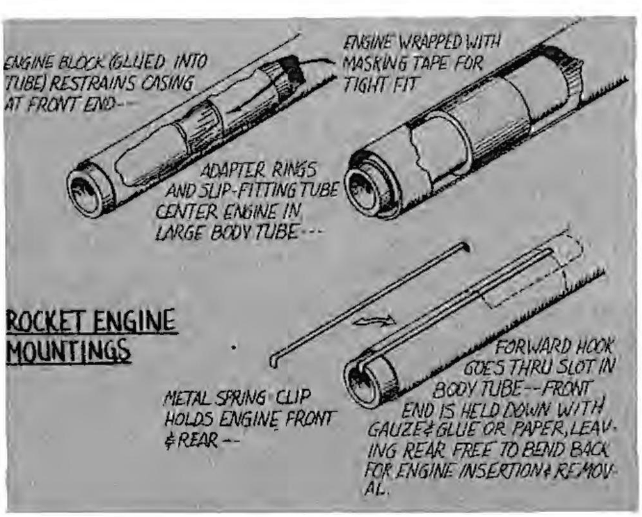
Always check an engine over before using it. Once in a great while you might get a defective one, or more likely one which has been damaged in storage and handling. See that the nozzle looks round, without any damage, make

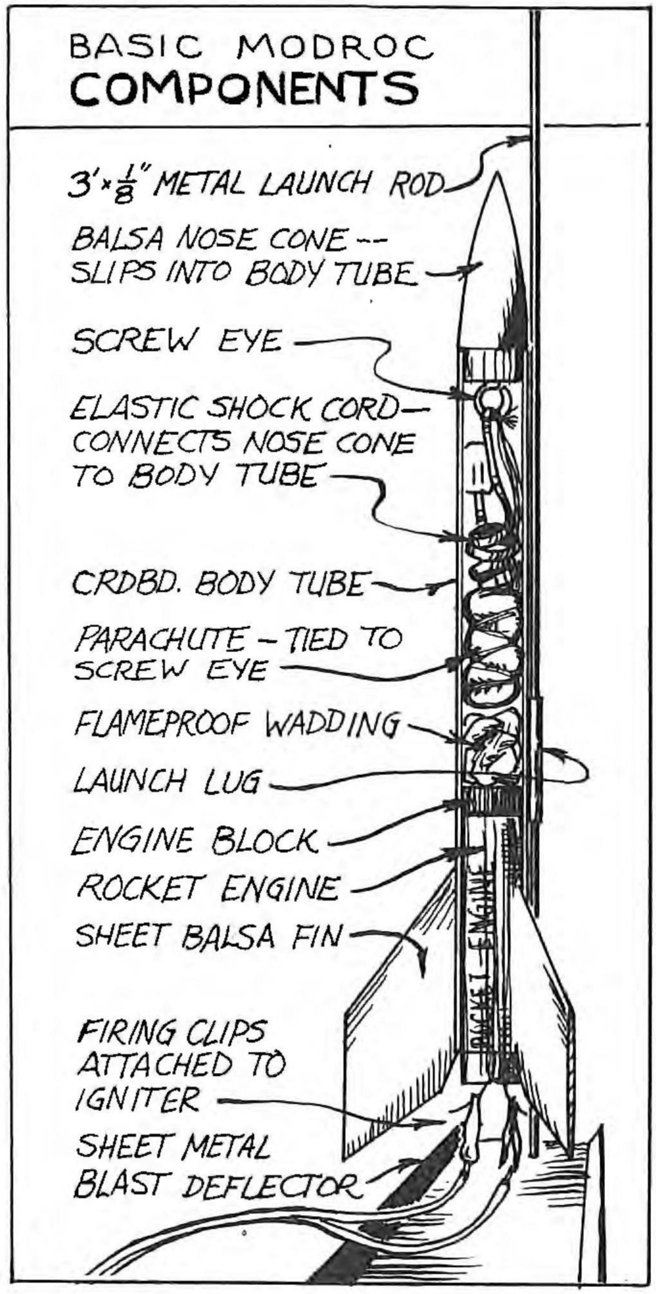
sure the casing is round and properly shaped, and check to see the white paper retaining cap is in place. If it isn't, the ejection charge probably isn't, either. (Booster stage engines do not have retainer caps.)

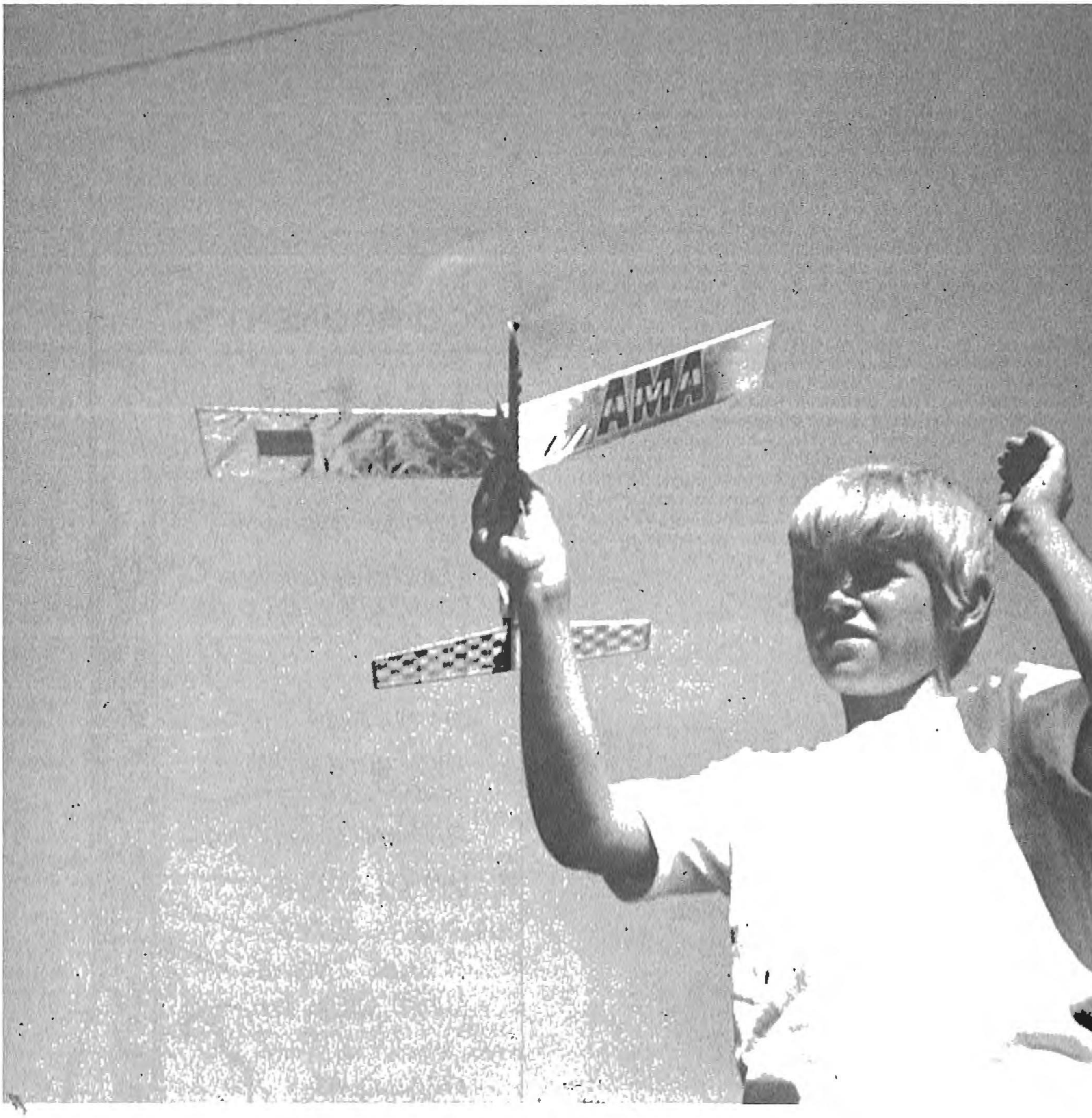
When you actually begin launching, try flying one model with a variety of engines. Refer to the manufacturer's list of recommended engines, and start with something on the lower end of the impulse scale, then work your way up as far as you dare. More impulse means more altitude, and more running for you during the recovery phase! Start small, and you won't lose your model on the first flight. If ejection seems to be occurring while the rocket is still climbing at a good clip, you might want to increase the delay time a notch to get more altitude. A little experimentation like this can teach you a lot about the subtleties of rocket flight. If you fly with a club, you can watch other people's rockets, and learn from their flights too.

With this look at modroc engines, you are hopefully in a better position to power your aerospace modeling creations. As your interest in rocketry grows, you may want to join the National Association of Rocketry (NAR)—the nationwide organization of model rocketeers in the United States. NAR members have access to special technical information, can get help in forming clubs, receive the monthly *Model Rocketry* magazine, and are covered by a $300,000 liability insurance policy when flying model rockets. Information is available from NAR, Box 178, McLean, Virginia 22101—mention the **Jr. American Modeler** when you write.









MAXI Jr

In all my years of model building and flying, nothing gave me greater pleasure than to design, build and fly the **Maxi Jr.** for the novice modeler. Before beginning construction, be sure you understand the plans. Use model airplane cement.

You will need a drawing board or other flat surface to work on. Let's start with the fuselage. Take a straight piece of 1/4 x 1" hard balsa, mark the dimensions directly on the wood and start cutting. For those of you fortunate enough to have an electric saw, this should be easy. If not, then a hand saw or razor should do the trick. Two cuts and you have the outline. Don't forget the small cut in the rear on the underside for the stabilizer. This gives us a little more lift. With your sanding blocks, first sand all surfaces smooth and then round all the edges as indicated on the plans, but

A WINNER OF THE NATIONAL FREE FLIGHT SOCIETY'S DESIGN CONTEST EMPHASIZES DURATION.

leave flat the top of the fuselage. Now cut all three pieces of your wing mount; sand and glue together. When dry, pin—don't glue—to the fuselage yet. Bend a large pin for the rear hook; glue and imbed it where indicated.

Next is the rudder and stabilizer. Put some wax paper over the plans so you don't mess them up with glue, etc. Start by pinning the outlines down and glue in the cross pieces. Do not stick pins into the wood; this weakens it. Rather, pin each side, alternating as you go. First put a pin on one side, leave approximately 1½" space, then put a pin on the other side—get the idea? Where all the joints meet, try to cut the cross pieces at an angle to form a snug fit. This looks neater and gives the framework more strength.

Repeat the process for the rudder. When the cement is dry, (maybe an hour or two) lift the framework off the wax paper. If it sticks, slide a razor blade under the stuck part to

by DICK MILLER

By using winder and stretching the rubber, many more turns can be had.

loosen it. After removing all the "gunk," trim with a razor blade. Then gently sand the surfaces smooth and round the corners slightly as indicated. Double check all joints to see if you missed any with the glue. If you have, put a small dab into the joint and set aside to dry. You might lay a flat heavy object on top while drying to prevent warping. Set aside until later for covering.

Now for the wing. All the ribs are the same size. You only need 12. Cut them from 1/16" sheet balsa and pin all the ribs together with two pins, one near the front and one near the rear. Take your sanding block and sand them all even so they match. Notch the top by making a cut where indicated for the spar. Two small cuts and the piece between can be pushed out with the blunt edge of a single-edge razor blade.

The wing is built in two panels which will be joined later for dihedral. Angled trailing edge stock may be purchased from your hobby shop. If not, sand this strip to the desired angle shown on the plans (a small triangle in cross section). Be sure to use a sanding block. Now pin this piece to the board as you did earlier for the stabilizer and rudder. Do the same with the leading edge. You can sand this to shape later. Now glue in the ribs where indicated and let dry. The two center ribs should angle outward slightly when glued in place.

Lay the spar in the notches, but first put a little glue in each notch and be sure to let a little of the spar extend toward the center. Do not put glue on any of the spars where they meet in the center, leading edge, center spar or trailing edge. Now, when dry, lift each wing panel off the board, sand the leading edge to shape gently with the sanding block and check all joints to see that they all have glue. All spars, leading edge, center, and trailing edge should have a slight upward angle cut or sanded into them where they will be joined in the center. This is so the panels join properly for dihedral. For maximum strength it is best the joints fit snugly.

Now anchor one wing to the board by pinning or laying a heavy object on it. Take a block of wood and put it under the other wing tip so that it measures 4½" high off the bench at the tip. Put glue on all the joints and the center ribs and anchor this wing panel to the bench after gluing both panels together. When dry, gently lift entire wing off board and remove excess glue. Check if more glue might be needed in the joints. Cut your small gussets and glue them in place where shown. This adds important strength to your wing.

Now we are ready for covering with light Japanese tissues, making sure the grain runs spanwise. (Cover the stab on top and the rudder on one side. This saves weight and it is not necessary to cover both sides of these surfaces on this size model.) Pin the tissue on the board (over the wax paper) so that it is smooth. It doesn't have to be perfect. Then take some dope—like Sig's, Ambroid, Aero Gloss, etc.—and with a small brush, put a thin covering to the surface outline of the stab, not the outside edges. Then put the wet side down on the tissue and gently lay an object such as a ruler on top and a lightweight object on top of this. When dry, use a sharp razor to trim off the excess tissue; either by cutting it off in the part's upside down position, or by holding the part upright in your hand. Do it gently so as not to tear the tissue. After all excess has been trimmed off, inspect for ragged edges which can be doped down with a dab of the brush and then smoothed with the finger. It is now finished and the same treatment can be given the rudder.

Cover the bottom of the wing in two pieces. First dope the surface outline with the brush. Now quickly take a piece of tissue and lay it across the bottom of the wing. Simultaneously with both thumbs gently pull the tissue over the leading and trailing edges until it gets somewhat smooth, going all the way to the tip. With thumb and finger of one hand, hold the tissue in place over the center and take out the rest of the wrinkles with the other thumb and finger by smoothing the paper toward the tip. If you missed a spot with dope, slip the brush between the tissue and the wood and rub smooth with the finger. Do the same with the other bottom half of the wing.

Turn the wing over to cover the top. It's easy to cover the ribs on the top. Use exactly the same technique, only don't pull the tissue as tight. A little slack is more desirable than having the tissue too taught. Without the slack, warps develop, resulting in poor flights. When dry, trim off the excess tissue. If you have a spray gun, spray a fine water mist over the tissue to shrink it. (Not too much.) After this is dry, brush one light coat of clear dope on the wing, top and bottom. Now we're ready to assemble the plane. Don't worry if it doesn't look like a professional MonoKote job. This bird will fly like a screaming eagle.

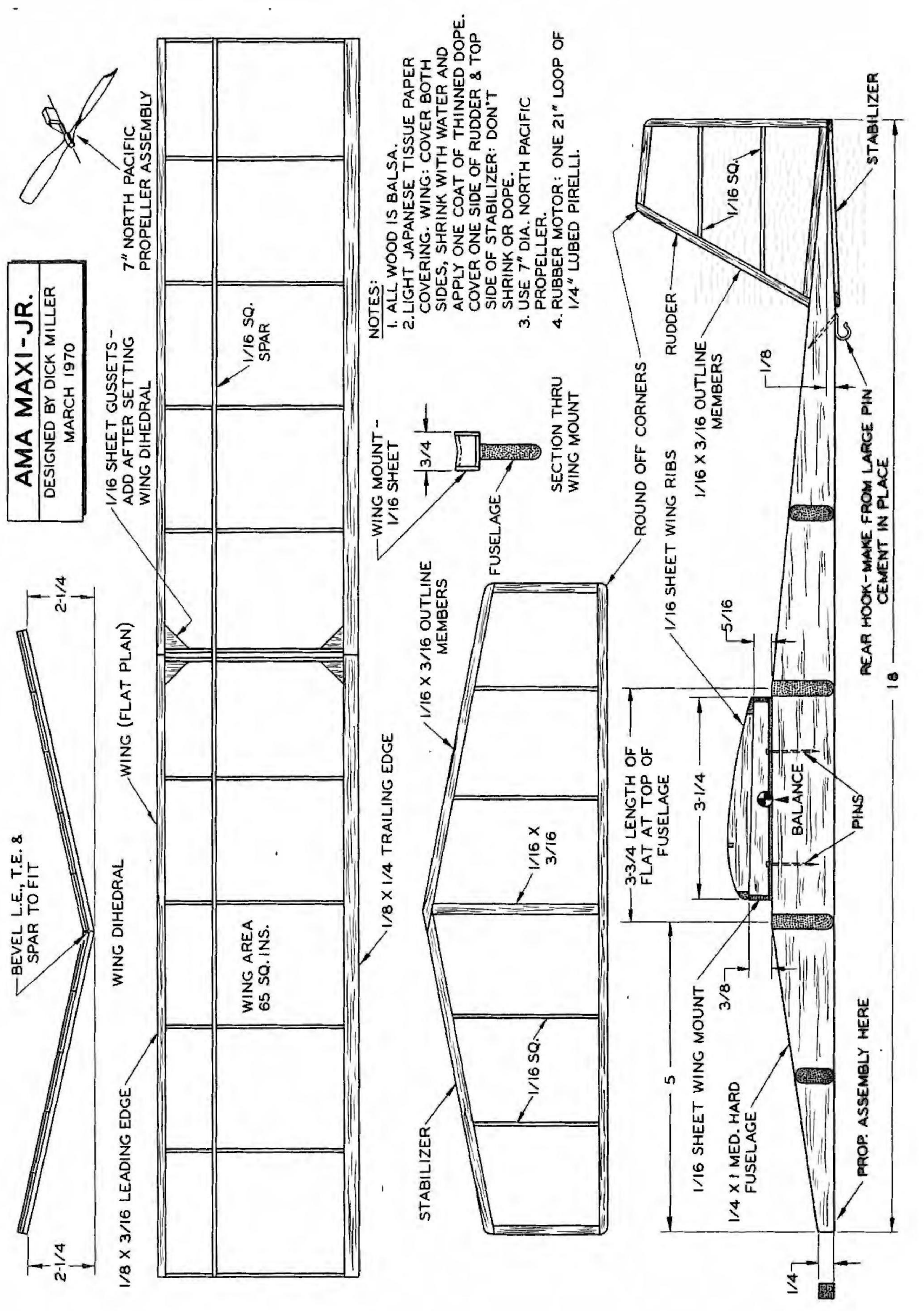
Glue the stab and rudder in place as shown, making sure they line up. Eyeball the assembly or prop it up as necessary. It is important to have all surfaces in proper alignment to each other. When dry, put the wing on the mount with a rubber band. (Put the rubber band under the fuselage, bring it up on both sides, spread it to get the wing through, and you're in business.)

Buy a 7" North Pacific propeller assembly; it has downthrust already built in. Before you glue it to the nose slice a little balsa off the top and bottom of the nose to give it a little more downthrust. (Prop points down.) After the plane flys the way you want it, then permanently glue on the assembly.

Use either Sig brown rubber or Pirelli; a 21" loop of ¼" which should be lubricated after the knot is tied. The lube also may be purchased from Sig. After tying a double (or triple) knot in the rubber, clip off the excess, pour some lube in your hand and rub into the motor. Then hang the motor on a door knob and stretch it to four or five times its

(Continued on page 58)

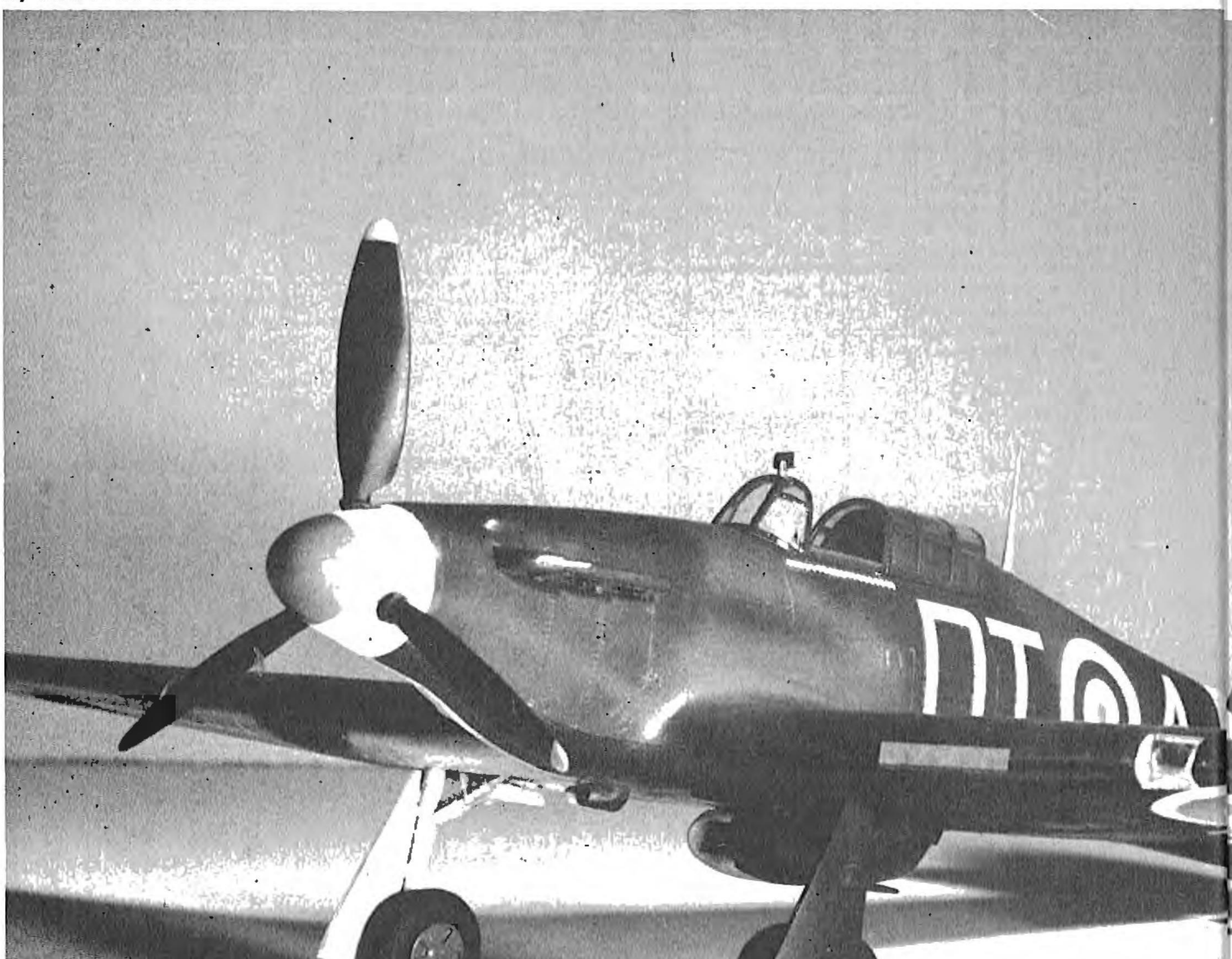
The rubber motor is made extra long to increase the number of "knots."



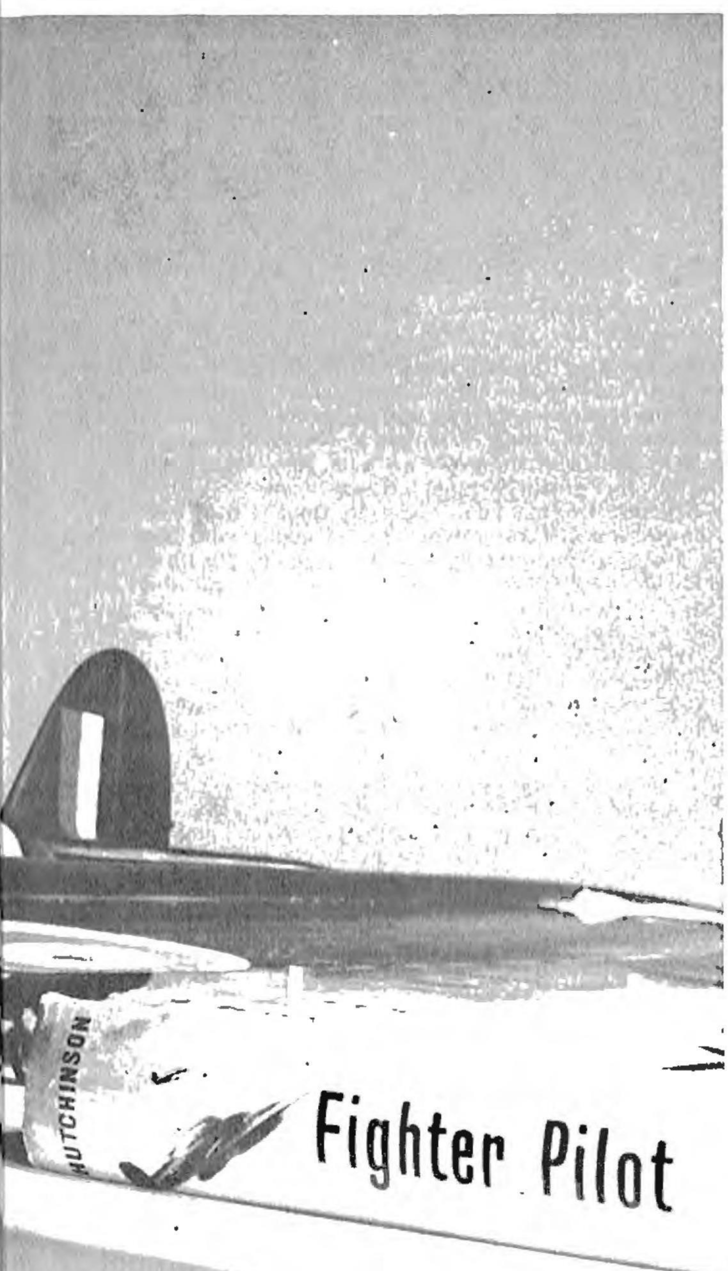
FULL SIZE PLANS AVAILABLE—SEE PAGE 48

Hurri

by MARVIN SOULE



icane



Building plastic model aircraft is an interesting and rewarding hobby. If you build a model aircraft from a kit, no matter how you assemble it, you will at least have had a hand in creating it yourself. In addition, you will have a decorative item to display—either as a "plane in flight" hanging from the ceiling, or as a shelf or desk display model.

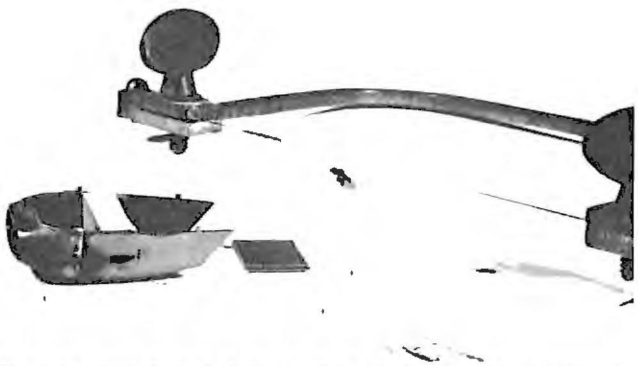
However, your model will only be as "decorative" as the time and effort you put into it. There are good habits to acquire which will get results if you are persistent in using them. It is good practice to use the best tools and materials you can afford and to research your model as thoroughly as possible. Above all, take the time to prepare, assemble, and paint your model well—don't lose your cool on the tedious job. This is what pays dividends on your completed model.

TOOLS AND MATERIALS: A list of the minimum equipment required must include a tube of Revell's cement or bottle of cement and a set of jeweler's files (available at hobby shops or mail order discount houses). Of course you must have a "trusty-knife"—a single-edge blade, good craft knife, or pocket knife. (In fact, a good sharp paring knife will come in very handy. Better get one of your own, though, don't swipe it out of the kitchen drawer.) Also include a small screwdriver or spatula which is good for filling in cracks, a pin vise and assorted drills, a package of assorted rubber bands to hold cemented parts together while drying, a roll of 1/2"-wide masking tape, and a can of "Duratite" thinner. A can of Duratite will last a long time. I have had the same can for almost a year and have built many, many models using it. There is only one thing to beware of—you *must* follow the directions on the can to the letter, or you will not get good results on your models and you will not get your money's worth either, as the Duratite will dry out in the can.

In addition to your tools and supplies you will need the following: Assorted grades of wet or dry sandpaper (very good for sanding and blending dividing lines on camouflage or mottle pattern. One sheet of each of the wet or dry, starting with No. 200 through No. 500 will take care of normal needs and can be purchased at hardware or hobby shops); inexpensive metal tweezers and paint brushes from No. 0000 to 1/4" (good brushes are a wise investment as they will last a long time if you take care of them); a pressure can of primer coat (this is always required and light gray is the best color, as it is easy to cover over this shade). You will also need a spray can each of Testor's clear Glosscote and one of Dullcote No. 1260, which leaves a transparent, flat, satin finish without altering the color, and finally a set of flat enamels in assorted colors. You can make a temporary paint-mixing tray of pieces of aluminum foil pressed into discarded can lids. For cutting out decals, curved manicure scissors are best. Use these also for cutting out the intricate shapes for masking off for mottle, camouflage, etc. For applying tube cement to small parts, use round cocktail toothpicks. To wash off mold release which is common to all plastic kit parts, household detergent such as Trend will do the job.

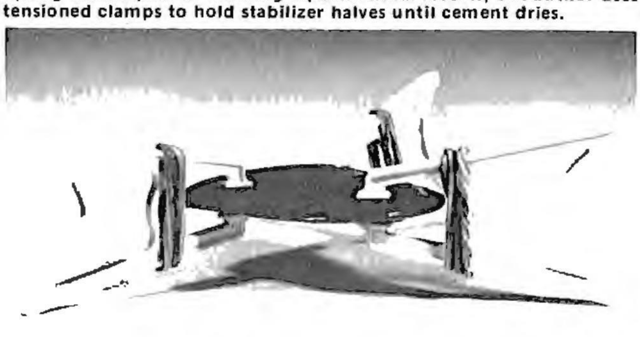
The above is just a minimum list, nonetheless you will find that even this assortment of supplies must be carefully

Hurr



• Extra touches can add so much to authenticity. Here, the radiator, cut from a piece of balsa wood, is inserted into air scoop.

Spring clothespins or masking tape are usual resorts, but author uses tensioned clamps to hold stabilizer halves until cement dries.



put away after use or you can easily lose some of the box makes a very good toolbox. Believe me, the other members of your family will greatly box makes a very good toolbox. Believe me, the other members of your famile will greatly appreciate this little effort on your part. *Nobody* likes to see this sort of stuff littered around!

Before you start your model, try to get a copy of Profile Publications Brochure No. 111, "Hawker Hurricane Mk 1."* Ask at your local hobby shop, or see the mail order ads for these little books which cost only about $1.00. They are probably the best reference books you can buy. The one for the Hurricane is especially good—inside the cover there is a full-color, five-view scale drawing of the pilot's plane featured in the kit model—the aircraft of Squadron Leader R. R. Stanford-Tuck, Commander of the 257th Squadron, R.A.F. I scaled up the drawing to 3/8 to use for the camouflage pattern on my model.

I used a 1/32-scale Revell King-Size Hawker Hurricane Mk 1 kit to make the model in the photographs. It is a lot of kit for the money with a wingspan of 15" and fuselage measuring 11-3/4". It has far more than size to commend it—a Rolls Royce Merlin engine with beautiful detail, as well as the finely detailed instrument panel and cockpit with sliding canopy. The pilot is in flight suit. An exceptional kit, with authentic, full-color box art worthy of framing. Even the different textures of fabric and metal can be clearly seen, due to the good die work. The decals are matt finish, for Stanford-Tuck's aircraft.

STEP 1: PRE-ASSEMBLY INSTRUCTIONS: Soak all your kit parts in warm water and detergent to get the mold release off the parts. This "greasy stuff" does just what it infers—releases the plastic kit part from the mold. All kit manufacturers use this in their kits, so you will always have to "dunk, rinse, and dry" every time you build a kit model. After drying, your parts are ready to be broken off the plastic trees as you need them for each assembly. Another thing which you should do is to check your kit for broken or missing parts. This should be done before the dunking process. Also, to avoid losing small parts, use a mesh strainer to contain them during the dunking and rinsing.

First remove the separating lines on parts with sandpaper or a file, or scrape off with single-edge razor blade or knife.

icane

STEP 2: ASSEMBLY: Paint all edges of fuselage three or four times with a liquid cement until the cement softens the plastic. Quickly place the two fuselage parts together, making sure they are in exact alignment. Apply masking tape strips crosswise on the top and bottom of the fuselage to draw the two halves together tightly. (Width of the masking tape can be 1/2", 3/4" or 1".) If you don't have masking tape, rubber bands will work, but they are a little harder to handle. Now use the same procedure on the wings as you did on the fuselage, then assemble the model according to the kit instructions.

COLOR SCHEME: Left wing undersurfaces: black. Right wing undersurfaces: sky color. Camouflage pattern: dark green and dark earth. Band: sky color. Propeller blades: flat black with yellow tips. Spinner: red and white. Landing gear covers: right side, sky color; left side, black.

MARKINGS: Code lettering was introduced on British aircraft late in 1938. Three letters were used on each aircraft; two painted together on one side of the fuselage roundel indicated the Squadron to which the aircraft belonged and the third one identified the individual aircraft within the squadron.

Reading from the cockpit to the sky color band, Stanford-Tuck's aircraft is marked on left side as follows: "D," "T," roundel and "A." Letters "D" and "T" signified that the aircraft in this case was attached to Fighter Squadron 257; the "A" was the aircraft letter within this Squadron.

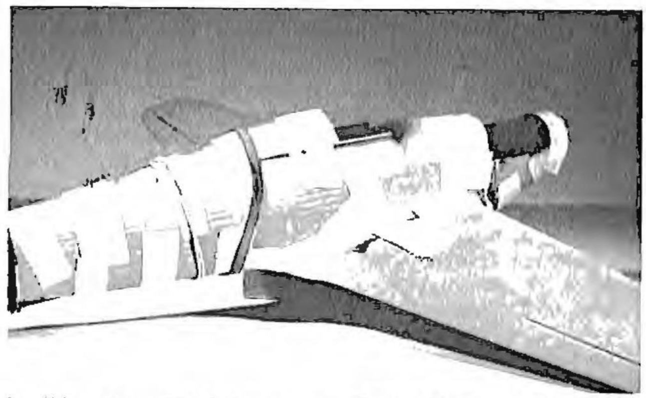
On the right side, starting with the sky color band and reading forward, markings are as follows: "D," "T," roundel and "A".

Tires on wheels are painted flat black with a bit of white added to mix an off-black shade.

Paint the metal portions of the canopies dark earth color. This is one of the most difficult parts of the entire model, so take your time with it.

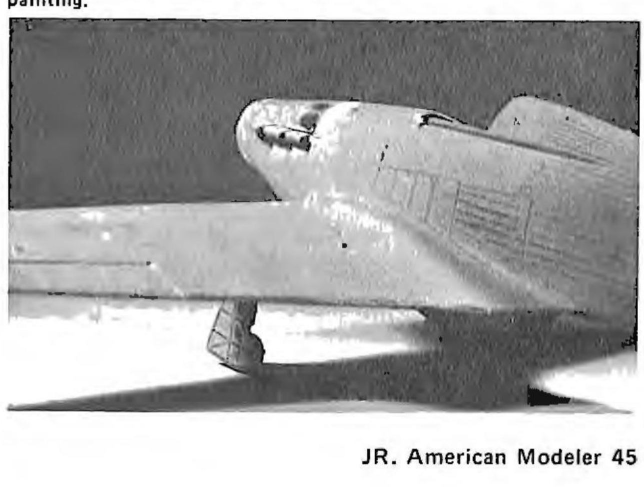
If you have taken just a reasonable amount of care in building your Revell Hurricane, you should have a most attractive addition to your collection. If it is your first model, you can feel justifiably proud of your effort.

**[Note: Issues of Profile Publications may be obtained from J.W.C. Publications Corporation, 7506 Clybourn, Sun Valley, California 91332, to the attention of Mr. Mark W. Caylor, Manager.]*

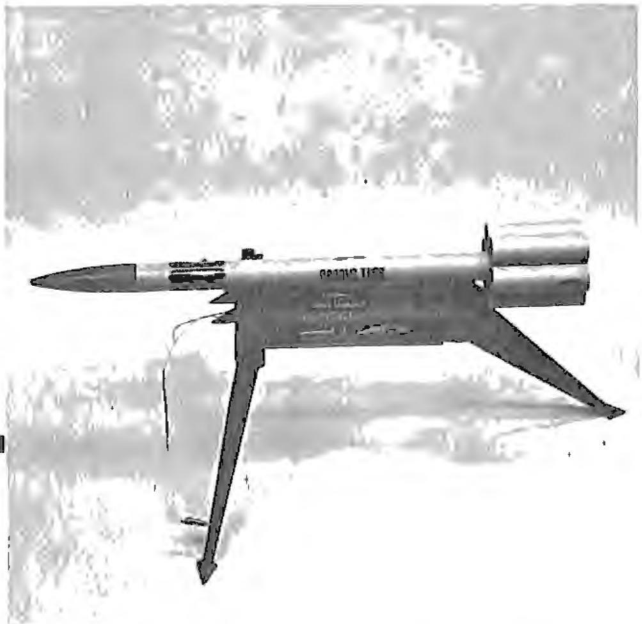


In this photo the interiors have been painted, and the parts cemented together with masking tape and rubber bands for the pressure.

For smooth wing-fuselage joint Duratite was applied and sanded. The model has been prime-coated and sanded, ready for final painting.



new products



Centuri Enginerring Company — Flying model rockets.

Centuri has introduced three brand new model rockets just in time for Spring. These rockets belong to a group of models called the "do something more" series. All three are quite different from most of the model rockets on the market. Design of the rockets assures good flights even if you have never built a rocket before.

I happen to like the Groove Tube best of those sampled. Everyone who watched this rocket flying thought that it was a multi-engined rocket that was difficult to build. Actually, it just takes one engine per flight, and assembles in about 20 minutes. One distinctive feature of the Groove Tube is that it has no fins. Instead it has six tubes that look as if they are holding engines. The tubes act as a stabilizing force and make the rocket fly true—even with the large C6-5 engine.

The X-24 Bug looks like a re-entry vehicle. This rocket roars into the sky and then glides back to earth. You can actually make adjustments in the glide, much as you would with a glider. The X-24 Bug took about an hour to build and is recommended once you have built and flown several rockets.

The Flutter By features gyro recovery. Using a low-powered engine, the rocket rises to its apogee like a regular rocket. At that point the rear fin separates from the main body of the rocket and both units spiral safely to earth. This rocket is excellent if your flying field is small in size.

If you have not tried model rocketry, I would recommend that you start with the Centuri Stellar Starter Outfit. This outfit contains everything that you will need to safely fly model rockets. A unique air-actuated system eliminates the cables and heavy duty battery power formerly used. This launcher lets you easily move to the best launch site. For $11.95 you get everything you need to build and fly.

Bill Dean's Book of Balsa Models

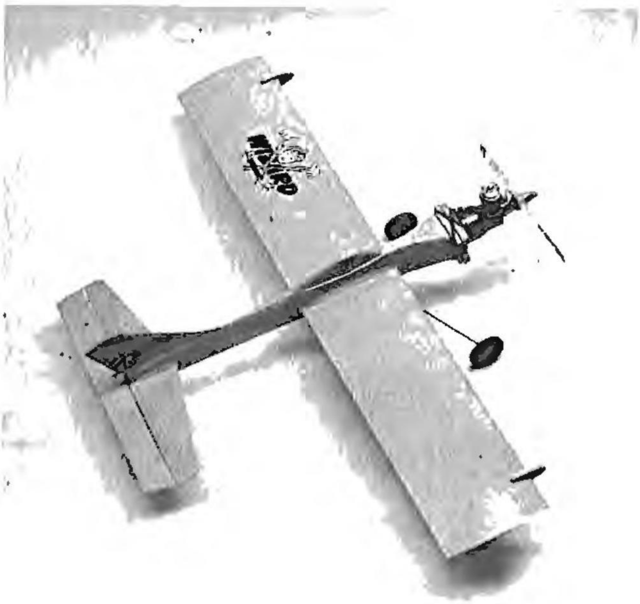
Often the beginning modeler will ask, "What is the best way for me to get started in modeling?" Unfortunately there is no single answer that can fit the needs of all novice modelers. One fact that is constant in all the advice that experts provide is for the beginner to learn the basics. Now there is a book available that teaches the basics of building and trimming balsa models. Bill Dean's Book of Balsa Models is an important addition to the library of every beginning modeler. It contains simple and easily understood instructions for making 18 working models from balsa wood. Full scale plans are contained in the book for each of the models, and an entire section of the book is devoted to teaching *how* the novice actually goes about building the models.

In addition to being simple to build, the models presented in Bill Dean's book consist of a series of model plane trainers. These six models teach basic building and flying skills and progress from simple to more difficult models. Building time of the models varies from 15 minutes to 6 hours. Most of the models are in the 2-hour range. This means that the modeler can build in the evening and be flying the next day. This is very good experience for the modeler because he can see the effect of any adjustment that he makes.

We built several of the gliders illustrated in the book. Our experience was very favorable with respect to the flying qualities of the models and the ease of construction. Any modeler can build these basic models in the time given in the book. My seven- and eight-year-old sons built the Dart midget glider in 15 minutes. We have flown this glider in the house in cold weather with the straight line record standing at about 40 feet. This glider costs only a few cents and provides hours of fun. The other models fly even better, but are outside models.

Now the Sig Manufacturing Company, Montezuma, Iowa is making a special offer to all modelers. Sig has assembled a "Balsa-Pack" which contains enough balsa in the correct sizes to build a selection of five models illustrated in Bill Dean's book. This service of Sig is helpful to the beginner because it eliminates the sometimes difficult task of balsa selection that is faced by the novice. The price of the balsa pack is $3.00 (incl. postage), and is available directly from Sig Mfg. Co., 401 South Front St. (Dept. BD), Montezuma, Iowa 50171.

by PAUL KUGLER



Carl Goldberg Models —Li'l Wizard

Learning to fly control line can be a frustrating experience for the younger modeler. Usually the beginning flier starts with an .049 model that is easy to start and difficult to fly. The Li'l Wizard is an .049 powered model that was designed especially as a trainer for the young, beginning modeler, and flies as well as many larger models.

Carl Goldberg produces the Li'l Wizard trainer with a unique "Fail-Safe" system. This device is excellent for protecting beginners from the problem of slack lines. If the lines happen to go slack during flight, "fail-safe" takes over and is capable of flying the model without any help from the pilot for a half lap. Here is how the device works: an automatic slight-up control is built into the bellcrank, and an unusually heavy weight is built into the outboard wing. When the lines lose their tension, the model immediately starts to bank toward the outside of the flying circle. At the same time the airplane starts a gradual climb. This is almost the opposite of what most ½A models do in similar conditions.

Instructions for building the Li'l Wizard are also designed for the novice. Each step is clearly explained and illustrated to help the modeler. Although you can build the model in less time, I suggest that you allow four evenings for a top notch job. Care in building will provide a model that you can be proud to show your friends.

The Li'l Wizard is advertized to fly on 52-foot dacron lines. We tested the ship on 50-foot lines and it really did fly well. Line tension was good and the model was under control at all times. This feature of flying on longer than normal lines (the Fail-Safe is insurance) is very helpful to the modeler who is just learning to fly because the plane appears to fly slower when viewed from the center of the flying circle. Another feature that the new flier will appreciate is all-balsa construction along with a shock-absorbing motor mount. The first model always takes a lot of bumps, and this model is designed to minimize the damage.

The Li'l Wizard is available at your hobby shop for $3.50.

ACE '72 Commander Rudder Only Pulse Proportional

The ACE '72 Commander system is the easiest way for the modeler to explore the radio control aspects of the hobby. The system is lowest in cost, and is simple to install in a wide assortment of model planes. Control is quite effective, with the range of manuevers increasing as the modeler gains skill in flying.

The first issue of JAM described the 1971 ACE system in considerable detail. There have been some important changes in the '72 Commander, but not to the point of making the 1971 system obsolete. As a matter of fact if you have the earlier system, you may wish to add some of the improvements to your unit. The most important change is that of incorporating a Brain Drain in the Airborne receiver. This means that flying time is increased about 70%. Using the experience of several hundred comparison flights, it can be easily verified that this feature is valuable. The second change is the building of connectors into the airborne unit. You can now bring several planes to the flying site and switch the receiver from plane to plane. At a minimum you will need a separate actuator for each model, but these are relatively cheap. The last change is increased transmitter output which provides a stronger signal. This was never a problem with the 1971 unit, but it may prove helpful in areas where there is a great deal of interference.

ACE does all they can to help and encourage the young and beginning RC modelers. Their instructions are very complete and understandable. In addition they provide a followup service that is unusual in this day of buyer beware. If you purchase one of their sets and run into any sort of a problem or have any question just send them a note. I can say with assurance that you will receive a prompt, detailed answer. They really want you to enjoy their product.

The '72 Commander that we tested has performed well over a duration of 200-plus flights. Pilot error has resulted in several bad crashes, but with no damage to the unit. You can fly this system in all kinds of weather, and perhaps our greatest feeling of satisfaction comes when others with RC units costing hundreds of dollars more come to watch us fly when they are grounded by high winds. After testing all of the systems offered by ACE, we recommend starting with the Stopper combo at $74.95.

✱FULL SIZE PLAN SERVICE✱

We offer quick postage - paid service on any plans ordered. Do take advantage today.

( )JO121 Hot Canary $0.75
( )JO122 Sassy $1.50
( )JO323 Two Bits $1.50
( )JO324 AMA Maxi-Jr $1.50

Gentlemen: I've enclosed $..........for the plans checked above.

american JR MODELER
733 Fifteenth Street, N. W.
Washington, D. C. 20005

Name...
Address..
City, State, Zip...

Q&A

(continued from page 6)

A. Props are sized by diameter and pitch, and the size is usually marked on the front face of the blades. The pitch is the theoretical distance forward the propeller will move in one revolution. A low pitch prop acts like low gear in a car, giving better acceleration but not much speed. Conversely, a high pitch prop is equivalent to high gear, and gives you a good high speed but not much acceleration. Because we can use only one size at a time, we try to pick the prop which is the best compromise of these two objectives. Most engine manufacturers give the recommended prop sizes for their engines, and many kits list the best engine size and prop size for that particular plane. Use these as a starting point, and experiment with different diameters and pitches to find the combination which gives the best performance.

Q. I need help on tissue covering. It seems that I either get a surface full of wrinkles or one so taut that the structure is all warped. How do you do it right?

A. Proper covering of an airframe can be broken down into three basic steps; *preparation*, *covering*, and *finishing*.

Preparation begins with a thorough sanding of the entire framework with fine sandpaper to remove rough edges, glue blobs, and surface imperfections. On sheeted or block surfaces which are to be tissue covered, fill any gouges or low spots and sand to get an even contour. Dents can be removed easily, at no weight increase, by wetting the low area and steaming dry with a hot iron. This causes the wood fibers to swell and expand back into their original shape. After sanding and filling, get out your brush and clear dope and give the entire framework two or three coats (sanding with fine grade paper after each coat). Take your time and do a goo job. If you have done it right, you should be able to drag a nylon stocking across the surface of the wood without snagging on balsa slivers or sharp edges.

Once the framework is doped and sanded to your satisfaction, you are ready to begin covering. Begin with the wing, stabilizer or rudder, since straight, flat surfaces are the easiest. Cut a piece of tissue about 1" larger in all dimensions than the part to be covered, with the grain of the tissue running parallel to the longest dimension. (You can find the grain direction by tearing the tissue along its width and length, near a corner. It will tear straight with the grain and uneven against.) Now mix up some clear dope half and half with thinner. Apply the dope along one edge of

(continued on page 51)

SIG THE ONLY WAY TO FLY

RUBBER POWERED - GLIDER
CONTROL LINE - RADIO CONTROL

$4.95

KIT CL-13

SHOESTRING

U/C PROFILE
SEMI-SCALE GOODYEAR RACER
WINGSPAN: 28" ENGINE: .10-.15

CABINAIRE

DESIGNED BY PAUL McILRATH

RUBBER-POWERED SEMI-SCALED FLYING MODEL

WINGSPAN: 22"
WEIGHT: 1 to 2 Oz.

KIT FF-20
$1.50

* Complete Building and Flying Instructions
* Detailed Plans with Isometric Construction Views
* Formed Plastic Propeller
* SIG Contest Rubber Strip for Maximum Turns and High Flight Performance
* Die Cut SIG Balsa Parts

SINBAD 40

TOWLINE GLIDER
BIG 40" WINGSPAN

KIT FF-3
$2.95

Strong, Simple Construction
Kit Features Die-Cut Sig Balsa

PIPER SUPER CRUISER

1/2 A FLYING SCALE

FREE-FLIGHT .020 to .049 Engines
CONTROLLINE .049 to .10
RADIO CONTROL .049 to .10

Plans for Float Conversion
Authentic Decals
Formed Wire Landing Gear
Celluloid, Covering Tissue
Full-Size Detailed Plans
Die-Cut SIG Balsa and Plywood

36" WINGSPAN
1" SCALE
KIT FF-8
$4.95

SUPER SINBAD

TOWLINE GLIDER
KIT FF-2
$5.95

62" WINGSPAN
FREE FLIGHT OR RADIO CONTROL
A high performance towline glider of proven design.
Strong, Simple Construction.

BUSTER

KIT CL-12

U/C PROFILE
SEMI-SCALE GOODYEAR RACER
WINGSPAN: 24" LENGTH: 24½"
ENGINE: .010 to .15

$4.95

FLYING SCALE SUPER CADET

For Free Flight, Rubber Power or Control Line
May be Adapted for Miniature R-C Equipment

1" Scale
35" Wingspan

KIT FF-18
$5.50

KIT FEATURES:
.020 to .049 Engines in Free-Flight
.049 to .099 in Control Line

Full-Size Plans
Special Rubber Power Prop Instructions
Formed Wire Landing Gear
Die Cut SIG Balsa and Plywood
Hardware Package
Control-Line Bellcrank

STINSON L-5 SENTINEL

RUBBER-POWERED FLYING SCALE

Large Detailed Plans With Construction Isometrics
Special Rubber Power Prop Instructions
Die Cut SIG Balsa and Plywood
Authentic Decal Decorations
Formed Landing Gear
Clear Plastic Windshield
Covering Material

34" WINGSPAN
1" SCALE

KIT FF-17
$4.95

SIG

SCHWEIZER 1-30

Combination Free-Flight or Control-Line Flying Scale
May be Converted to Miniature R-C Single Channel Pulse Equipment

1" SCALE
KIT FF-19
$4.95

40" WINGSPAN

Molded Canopy
Authentic Decals
Covering Material
Hardware Package
Formed Landing Gear

Control Line Bellcrank
Molded Plastic Cowling
Die Cut SIG Balsa and Plywood
Detailed Plan With Construction Isometrics

ENGINES: .010 to .020 for Free-Flight
.020 to .049 for Control-line Scale

Send Only 50¢ Today for
SIG'S BIG NEW CATALOG!
The Model Builders' "Bible"

NO POSTAGE REQUIRED WHEN ORDERING CATALOG ALONE

THE 1972 SIG CATALOG is the greatest Model Airplane Catalog yet! Over 224 pages devoted exclusively to merchandise used in the building or flying of model airplanes. Features the complete Sig Line, plus practically all other lines available. Hundreds of models are illustrated including gliders, sailplanes, rubber-powered flying scale, control line stunt and scale, and every type of R-C model. Send 50c today for your copy or buy it from your local hobby dealer. You will agree it is the best bargain in the model airplane industry.

ORDERING INSTRUCTIONS

SEE YOUR DEALER FIRST!

If he will not supply you, then order directly from our plant. We will ship promptly. To Order, please add $1.00 for postage and handling in the U. S. Canadian orders please add $1.50. Minimum order is $1.00. Please remit by bank draft, check or money order. Print your name and address plainly. Sorry, No C.O.D. shipments. All prices subject to change without notice.

SIG MANUFACTURING CO., INC.

401 S. FRONT STREET
MONTEZUMA, IOWA 50171

Two Bits

(continued from page 16)

Next—the landing gear is sandwiched between the firewall and Former 1. Now install the top and bottom sheets. The top one is cut out to surround the pylon. Glue them on and use little pieces of masking tape to hold them in place until dry. (I often use masking tape to hold things together while gluing. Pins just don't hold two surfaces together as well as masking tape. Dad won't miss a few feet from his roll!) This completes the fuselage, except for a careful sanding with fine sandpaper.

Cut the rudder from 1/16" sheet. Sand both the rudder and the stabilizer and glue them to the fuselage. Be sure that the rear portion of the rudder is free to move since it is used to trim the model in flight.

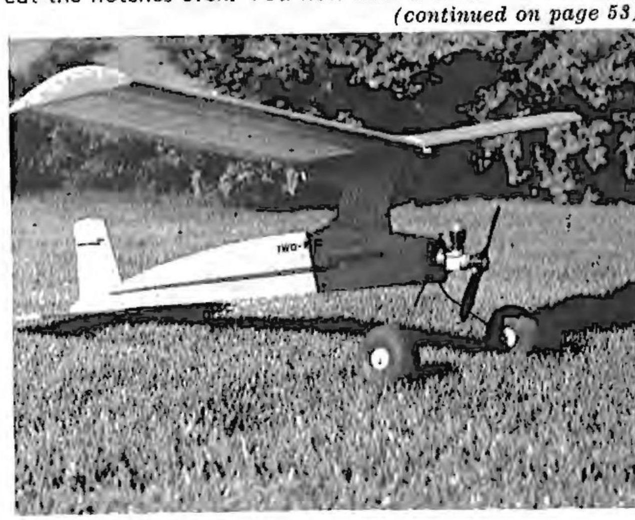
One coat of very thin, colored dope, covered with two or three coats of clear fuel-proof dope, is all that is necessary. The trim is made from pieces of contrasting-colored Jap tissue doped on after the fuselage is finished.

From a piece of aluminum (the top of a soft drink can is fine) cut a square of metal whose length is exactly equal to the length of Rib 1 and whose width is about 2". Trace the top curve of the wing rib on the aluminum and then cut it out with old scissors or tin snips. File or sand this curve to exactly the rib curve on the plans. Draw a line across the aluminum jig where the bottom of the rib comes and cement a piece of 1/16" balsa from this line to the bottom of the jig. (See sketch.) To cut ribs, you place the jig on a sheet of 1/16" balsa, with the balsa part of the jig butting against the bottom edge of the sheet. With a sharp single-edged razor blade, cut alongside the jig the trailing and leading edge width, then cut around the top curve of the jig and one perfect rib will fall out. Keep this up, moving down the full length of the balsa sheet; turn the sheet over and do the same down the other edge. If you do not have enough ribs, cut a new straight edge and start over. When you have finished you will have 28 ribs all exact duplicates of each other. (I usually make a few more in case I break one.)

To cut the notches in the ribs, make a cardboard pattern exactly like Rib 2 and use it to remove the material for the spar notch and top and bottom sheeting at the leading edge. The old timers have a secret: stack all the cut ribs together, holding them together with a thumb and finger, place them on your working board, bottom down, and shove their leading edges up against a stop (use a strip of wood tacked to your working surface) and with a strip of 1/16" balsa push against the trailing edges until the leading edges are all tight against the stop. Then push pins in from each side of the stack of ribs until they make one packet.

Shove this packet out over the edge of your working surface, and using the square edge of the surface as a guide, sand the leading edge of all the ribs even and square. Do the same for the trailing edge. Scrub the bottom of the packet on a piece of sandpaper on your board to get the bottoms of the ribs flat then sand the tops gently. A razor blade will cut the notches even. You now have a set of identical ribs.

(continued on page 53)



Q&A
(continued from page 48)

the part, such as the leading edge of the wing or stab, and lay the tissue in place, rubbing it down along the wetted area with your fingers. Repeat this process along the opposite edge and the adjacent sides, pulling the tissue just enough to remove wrinkles but not stretch it tight. If you get wrinkles that will not come out with gentle pulling, dip your brush in thinner and apply over a previously doped-down edge to loosen it, and work the wrinkle out in this manner. Just be sure that you don't pull the tissue too tight. What you are after is a smoothly covered surface with the tissue just slightly sagging between ribs. When the dope is completely dry, trim off the excess tissue around the edges with a razor knife and seal the edges with a light coat of clear dope, sanding after it dries to remove fuzzy edges. Then repeat the whole process on the other side of the panel. It is easiest to cover all the major assemblies individually in this manner before gluing them together.

Once the panels have been covered, it's time to water shrink. Using a spray bottle of some type (a Windex or other household detergent bottle with a spray head works fine), spray a fine mist of water over the entire panel, on both sides. Don't soak the tissue, just dampen it slightly. Pin the part down to a flat surface to dry; this will minimize warps. If the tissue is still not as tight as it should be after drying, re-spray a second time. Warps can be removed by holding the panel over a steaming tea-kettle for a few minutes and twisting in the opposite direction while it cools. If you don't get the warp out on the first try, do it again until the panel is straight and true.

One note concerning tapered fuselages. When covering tapered fuselages with compound curves and multiple stringers, it is best to cover only the area between two stringers at a time. To avoid warps, begin at the center of the fuselage sides and work upwards and downwards toward the center, alternating sides as you go. Water skrink the fuselage after it is completely covered.

When all parts have been covered and water shrunk, you are ready to assemble the model and finish it. Apply a couple of coats of clear dope to the entire model, either by brushing or spraying. After the dope is dry, you may have to steam again to remove warps which have crept in during the doping process. You should now have a flyable model. Final finishing may consist of color doping and trim, but go easy on the color. Weight is your enemy, and color dopes are heavy. A lot of paint can make a plane tail-heavy. On lightweight models, it is better is use colored tissue for trim instead of dope.

Q. After finishing my model, I noticed that all the wing ribs are visible as low spots under the wing sheeting. What caused this?

A. Most likely, this condition was

(continued on page 52)

solidly backed up by the ribs. Therefore, you will sand more wood off over the ribs. To prevent this, sand the sheeting *before* gluing it onto the wing so that you will only need to touch it up lightly later.

Q. I get dizzy when flying control-line planes. Is there any way to avoid this?

A. Use the old skater's trick of "watching the spot." Pick out some easily recognizable object in the background, such as a tree or house. As you turn around, keep this object in focus for as long as you can while still keeping your plane in view. You will find that this will help you get your bearings and the dizziness should cease. Using longer lines, where possible, will help also, as you turn slower using them. Start practicing loops and stunts which allow you to stand still for a moment. Or use less gas for shorter flights until you become more experienced. After a while you won't get dizzy at all.

Q. My control-line plane is very unstable in flight. It reacts violently to the slightest control movement. I have only flown it once, and am afraid to try it again until I find out what is wrong.

A. It sounds to me like you have a plane with a case of tail-heaviness. This is a common problem and is easily cured by adding some weight to the nose. Add just enough so that the plane hangs slightly nose-down when supported at a point about 1/3 of the wing chord back from the leading ledge. Then try flying caused by sanding the wing sheeting. When sanding the wing, the sheet will

flex and "give" between the ribs, but is

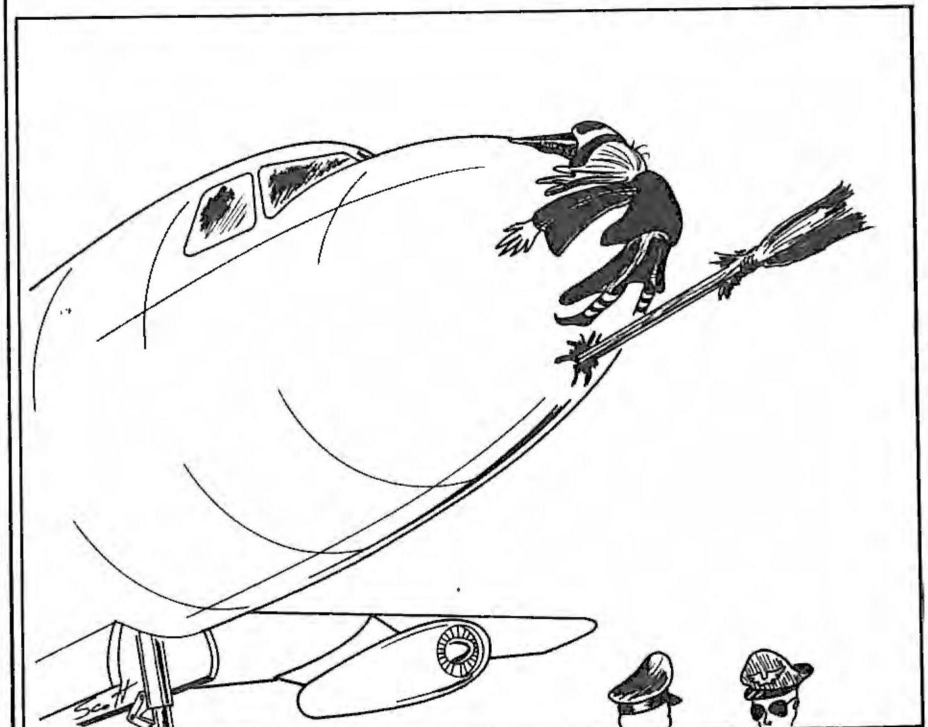
it again, and add more weight if necessary to smooth out the flight. Be sure that whatever weight you add is firmly attached so it can't come loose while you're flying.

Q. I have trouble with paint running under the edges of the masking tape. Should I use some other kind of tape?

A. Regular masking tape works fine, but the trick is to seal the edges with a coat of clear dope before putting on the color.

Q. Engine-starting drives me nutty. I flip and flip, and all I get is a few lousy pops and sputters. If I give it a light prime, it will usually catch and run for a second, but sometimes even that doesn't work. Help!

A. It appears that you have a couple of problems. First, I suspect that you have dirt or something in the needle valve (or reed, if you have a Cox engine). Get that cleaned out first. Remove the needle valve all the way and flush out the fuel passage with air and clean fuel. If you have a reed-valve engine, you will have to remove the reed to clean out the passage. If you have never done this, take the engine down to your hobby dealer and ask him to show you how, as it's a rather delicate job. Your other problem appears to be a weak battery or bad glow plug. The battery should be strong enough to light up the glow element a bright orange, and fuel in the plug should not put out the glow.



"THE F.A.A. ISN'T GOING TO LIKE THIS"

Two Bits

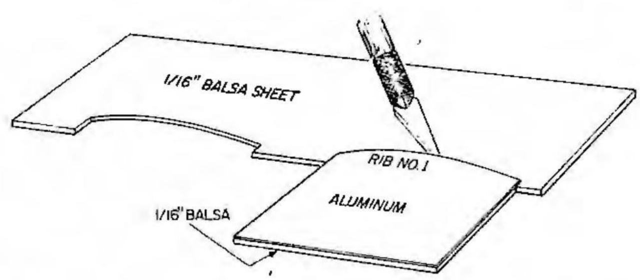
(continued from page 50)

When you set the distance between the leading and trailing edge pieces, every wing rib from one end to the other will fit perfectly. Pin the spar in place, glue the leading edge in place, then drop the ribs in place with a little bit of glue. Do not glue in the two center ribs; we'll take care of that when we put in the dihedral. When the ribs are dry, cement the top leading edge sheet to the leading edge and to each rib and pin in place until dry. Keep the wing pinned to your working board for at least 12 hours. This wing is so strong that I doubt that tissue could warp it.

Cut the wing into two pieces between the two center ribs, prop up one end 3" from the work board. Cut dihedral joiners from hard balsa and glue them in place. When the dihedral joint is thoroughly dry, put on the top center sheeting grain spanwise. Add the wing tips and sand the leading edge to shape. Very carefully, with fine sandpaper, go over the whole wing to knock off any rough spots. Give the wing two coats of dope, sanding lightly with finer sandpaper between coats, after which the wing may be covered.

Covering is not as difficult as most people think. When I buy Jap Tissue, I take along a few pieces of newspaper and lay the tissue out on the newspaper, then carefully roll it up. Don't allow the dealer to mash it in the middle with a rubber band. I keep it in this newspaper until ready to use. If your tissue is already wrinkled, have mom or your sister iron it out flat for you. This makes it easier to work with.

Start with the bottom of the wing. Cut a piece of the tissue about ½" larger than one-half of the wing paper grain spanwise. Lay the wing upside down on a table and have a small brush and some dope thinner nearby. Lay the paper on the bottom of the wing, smooth it flat and with the brush full of thinner, run a line of thinner onto the paper at the center of the wing. It will soak through rapidly, dissolve the dope, and cause the paper to stick to the wood. Allow this to dry a little bit then go to the end of the wing, grab the paper at the center of the tip and pull. Inspect the wing—if the wrinkles caused by your pulling run straight



down the wing you've done it correctly; if not, shift your finger and thumb slightly and pull again.

Hold the paper down against the wing tip and apply a little dope thinner—hold it tight till it dries. Now pull the paper tight out to the corners of the wing tip and apply thinner. Pulling the paper tight as you go, put thinner on the paper along the leading edge and then the trailing edge. The paper should cover the wing panel and be free from wrinkles. Use this system to cover the remainder of the wing. When you have the entire wing covered, arrange six balsa blocks of ¼" balsa on your working board so you can pin down the wing and make sure the shrinking and doping of the paper does not warp the wing.

When you are working on a wing, work only on that part which can be pinned to a level surface.

Use a homemade water sprayer to dampen both sides of one wing panel. (Finding a water sprayer these days is no trouble at all—get an old Windex or "409" bottle and fill it with water.) Immediately after spraying the wing panel, pin it to the working surface with a small block under each corner and one under the center of the trailing edge and leading edge. This will insure the panel drying with no warps. Repeat the process with the second wing panel. When the tissue shrinks tight, you can remove the panel.

Next step is to brush a thin coat of dope on the bottom surface of the wing panel and pin it back to the working surface as above. As soon as it is pinned to your board, give

(continued on page 56)

AMA CHARTER CLUB

AMA's 1972 CHARTER CLUB PROGRAM

Over 100 more model airplane clubs were chartered by the Academy of Model Aeronautics in 1971 than in 1970—the total number of AMA clubs is now over 800:

Look over the following list of "Benefits of the AMA charter" to see what is available to AMA Chartered Clubs. If the benefits seem worthwhile, here's how to get your club chartered or to form one for chartering: simply request a free club charter kit from: Academy of Model Aeronautics, 806 Fifteenth St., N.W., Washington, D.C. 20005.

BENEFITS OF CHARTERING

1. LIABILITY INSURANCE PROTECTION (See below for more details)

A. Helps obtain & keep flying sites.
B. Protects club & flying site owner.
C. No extra charge for sanctioned meet coverage.

2. SPECIAL ATTENTION & SERVICES

A. Reduced rates for club supply orders.
B. Special handling for club correspondence.
C. Leader membership for club-named officer.

3. EXCLUSIVE CONTEST SERVICES

A. Club listing in contest calendar.
B. Free sanction for each AA meet.
C. Nats club team eligibility.

4. SPECIAL INFORMATION AT NO EXTRA CHARGE

A. AMA Monthly Mailing—News from HQ.
B. AMA Competition Newsletter.
C. Special Club Publications.

5. PRIORITY ON FILM LIBRARY SERVICES

A. Some films only available to AMA Clubs.
B. Other films on first priority basis.
C. Reduced rate handling fees.

6. SPECIAL CLUB & CONTEST ADVERTISING

A. Special low rates and special handling.
B. National distribution via AMA Monthly Mailing.
C. Exclusive service for chartered clubs.

7. ACCESS TO AMA MAILING LIST SERVICE

A. Available at cost only to clubs.
B. Permits mailing to selected groups of AMA members.
C. Helps promote club activities.

WHY INSURANCE FOR CLUBS?

1. To protect the club - If the club is sued as a group, individual AMA member insurance does not apply. Club assets (financial and/or physical) can be lost. The same is true even if the club is not incorporated. Incorporation does not provide the funds necessary to defend a suit; club insurance does.

2. To protect the flying site owner - When a property owner is approached for a flying site, he is not concerned with whether the club is protected; he wants to be sure *he* is protected. Being able to provide the property owner with an insurance certificate naming him as an "additional insured" usually results in property use being granted. Such a certificate can be provided for a slight additional charge, to protect municipalities, farmers, airport owners, military bases.

3. To provide broader protection - Clubs can be sued for non-flying accidents which may occur at the club flying field, meeting site, or club contest. Such accidents may be caused by a club member, spectator, or anyone participating in a club activity. The accident may involve a fall, hanging signs, constructing field facilities or other non-flying activities in which the individual AMA member insurance would not apply. Between AMA individual and club insurance, protection for both flying and non-flying accidents is provided.

CLUB INSURANCE BENEFITS

1. $300,000 policy limit for any one accident, whether injury, death, or property damage. (Higher limits can be arranged at very little extra cost).
2. AMA member-to-member coverage included with only a limitation of a $100 deductible in member-to-member property damage claims.
3. Property owner may be named in special certificate at slight additional cost.
4. Pays all investigation and legal costs in addition to policy limit.

NOTE: Coverage does not apply:
a. to operation of vehicles; ordinarily covered by individual motor vehicle insurance.
b. to travel to and from activities.
c. to damage to property owned by the insured club. Claims resulting from use of club's property are covered, but not the property itself.
d. where other insurance is applicable—AMA insurance applies in excess of any other coverage.

CLUB CHARTER COSTS (INCLUDING INSURANCE)

A $10.00 basic fee, plus 50 cents per club member, is all that is required to obtain the new club charter.

WHY THE COST VIA THE ACADEMY IS SO LITTLE

There's a broader insurance base, individual member's insurance has always been low-cost because all AMA members were included. On the same principle, club insurance is cheaper because all AMA chartered clubs are included. Similarly, model meet insurance is cheaper because all sanctioned meets are included.

AMA individual insurance has provided basic protection to members for many years. AMA, which has insured model flyers since 1940, has also insured AMA clubs since 1966.

"Pick a color that will show against the smog.......

Two Bits

(continued from page 53)

the top surface a coat of thinned dope. Do the same to the other panel. Allow this to dry thoroughly while you do other things.

I used the 2" blow-up tires with wooden spools in the center. These tires, with their great elasticity and size, protect the engine and prop. I have never broken a prop with Two-Bits. It is almost impossible to get the nose of this plane into the dirt. The landing gear will bend occasionally, but this is easily straightened. The wheels must be light.

Cut the wing mount from 1/16" balsa with the grain running horizontal rather than vertical. Glue a 1/8" sq. strip along each side edge as shown; for support it helps the V-shaped wing fit better. Glue this to the pylon and you can push pins down into the pylon to hold the wing mount gluing. Leave the pins in for strength.

Now to install the engine. Put one washer, for now, between the left side of the engine and the firewall so the engine will have a few degrees of rightthrust. You should have built in the downthrust because it is almost impossible accurately to put in down- and rightthrust at the same time you install the washers. Push two T-head or bead-head pins into the pylon just under the wing mount to attach the wing hold-down rubber bands. The model now is ready for test glides.

Here in Southern California, to find the recommended gentle slope covered with tall grass is a standing joke, but you fellows back East can find one. The fat wheels will protect the plane even if you have to test glide on a supermarket parking lot.

Holding the plane overhead, run into the wind until the plane tries to fly out of your hand, then launch it level, with a small push, directly toward the horizon, neither up nor down. If it glides flat out and lands gently on the wheels and rolls to a stop you have it made. If the nose comes up and it stalls, put a piece of 1/16" balsa strip between the trailing edge and the wing mount; this should flatten out the glide. If the model glides too steeply, with the nose down, put the balsa under the leading edge of the wing. The rudder should be bent so the plane will turn slightly to the left while gliding.

Two-Bits is designed to fly in a righthand turn under power. This is caused by the rightthrust of the engine which overpowers the left turn asked by the rudder. When the engine stops, the rudder takes over and changes the attitude from a tight right turn to a gentle left turn. For the first flight, put the prop on backwards; this will reduce the power slightly, and any errors you might have made will not produce such a violent reaction in the plane.

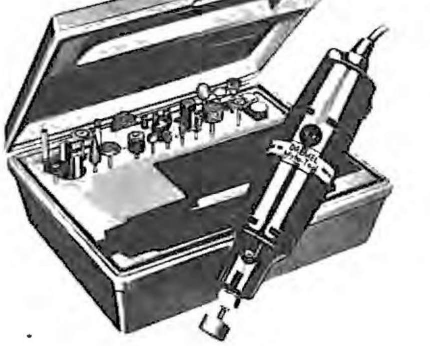
If everything is O.K., put a very small amount of fuel into the tank of your engine for this and succeeding flights. By accident we flew the plane with a full tank and it was almost lost directly overhead before the engine quit. Adjust the engine until it is running smoothly, face into the wind, run forward and launch the plane just as you did with the test glide. It should fly straight out for about 30 to 40 feet while gaining speed; then it will pull straight up as if to make a loop. On the top of the loop it will roll out into a tight, righthand climbing turn and will climb steadily until the fuel runs out (which should be no more than 20 seconds). Then the plane will transition to a wide lefthand turn.

If the wind is not blowing, the plane should come down very close to where it was launched. One morning, my son Tim caught the plane from where it was launched three straight times. The boys he flys with make it a game to see if they can catch the model before it hits the ground. If it is on the far side of the circle when it comes down, this takes a bit of running. If the ground is not too rough nor the weeds (that's grass back East) too high it comes in with a gentle sweep and makes a beautiful two-point landing and rolls to a stop. If you built Two-Bits carefully, it will be a tough little plane and will give you hours and even seasons of flying fun.

(continued on page 58)

JAM bi-monthly

MODEL CONTEST



Dremel No. 261 Moto-Tool Kit featuring the Model 260 Moto-Tool and containing 34 accessories including high speed cutters, emery and silicone grinding wheels and points, wire and bristol brushes, felt and rubber polishing tips, sanding discs, drum sanders and sanding bands, mandrels, dressing stone, finger grip extension, collet wrench, 1/8", 3/32", 1/16", and 1/32" collets—all in a molded polyethylene case, shown above.

Dremel No. 572 Deluxe Moto-Shop, featuring the No. 571 Moto-Shop, 3 sanding discs with rubber backing pad and adaptor, 4 saw blades, 1 grinding wheel and guard, 1 cloth polishing wheel, 1 wire wheel, 1 adaptor, 1 polishing compound stick, 1 flexible shaft accessory with finger grip and a 12 piece accessory set, shown above.

Entrants should indicate their preference of prizes

JUNIOR AMERICAN MODELER is pleased to announce the **JAM MODEL CONTEST**. This contest is designed to encourage the beginner and novice alike to be meticulous and exacting in the preparation and building of a model. This contest is open to kit-built and scratch built models. The contest is for both boys and girls. Come on girls! Show your brother!

Every two months **JAM** will award either a **Dremel Moto-Shop No. 572**, or a **Dremel Moto-Tool Kit No. 261**, the choice being that of the winner. Second and third place winners will receive a one year subscription to **JAM**, or if the winners are already subscribers, then their present subscription will be extended by one year past expiration date.

The following are the rules governing the **JAM MODEL CONTEST**. Strict adherence to these rules is necessary.

A. **Model Origin:**
Any kit that had its origin from a wood, plastic, metal, etc., kit is eligible.

B. **Categories:**
All types of models are eligible, i.e., planes, boats, cars, etc.
1. Boats
2. Cars
3. Tanks, etc.
4. Planes
   (a) Glider
   (b) Rubber-powered
   (c) Free-flight
   (d) Control-line

C. **Entrants to submit:**
1. Black and white glossy photos no smaller than 4 x 5 showing various views (minimum of 4). Polaroid pictures are acceptable.
2. Color photo or slide (OPTIONAL)
3. Close-up photos of detailed work may be supplied if desired.
4. A short write-up on the origin of the kit and any special techniques used in the building of your entry.
5. A statement that:
   (a) The submitter was the sole builder of the model.
   (b) The original kit is available at any hobby shop.
   (c) The photos taken and supplied were taken by the submitter.
   (d) The submitter is no older than 16.

D. **Judging will be on:**
Neatness
1. Workmanship
2. Quality of finish
3. Attention to detail

E. **JUDGING:**
Judging will be done by the staff of Potomac Aviation Publications and Academy of Model Aeronautics.

F. **Persons not eligible:**
1. Members and employees of Potomac Aviation Publications or any other model magazine.
2. Members and direct or indirect employees of Dremel Manufacturing Co.
3. Members and employees of any manufacturer of hobby kits, hardware, or supplies
4. Anyone engaged in the wholesale or retail distribution of hobby kits, hardware, or supplies.

G. **Models not eligible for submittal are:**
1. Models that have been submitted for judging of workmanship at any contest that placed 1st, 2nd, or 3rd in that judging.
2. Models that have won similar awards in other publications.

H. Entrants who have models that qualify under these conditions are eligible to enter the JAM Model Contest.

I. **Prize information:**
1. A Dremel kit will be awarded to the bimonthly first place winner. An illustration of the Dremel kit along with the winners picture, name, address, and description of the winning model will be published in **JUNIOR AMERICAN MODELER**. The second and third place winners of the bimonthly contest will receive a one year subscription to **JAM**.
2. Dremel Manufacturing Co. will be notified of the winners name and address so that the prize indicated may be sent.

J. All contest entries must be submitted along with the data required, to:

JAM MODEL CONTEST
Junior American Modeler
733 15th Street, N.W.
Washington, D. C. 20005

K. All photographs and materials sent by the contestant will become the property of **JUNIOR AMERICAN MODELER** and none will be returned or acknowledged.

This contest will be null and void in any state or locality where specifically prohibited by law.

(continued from page 56)

Two-Bits was originally designed as a result of wanting to reduce an "oldtimer" to ¼A size. Over a long period of time it was modified and redesigned until its present shape evolved. The last modification was made in order to simplify, as much as possible, the building of Two-Bits without sacrificing its flying characteristics. It was felt that the large balloon tires, which had so well protected the engine and props in the past, should be retained. In fact, during a test, before we discovered we had rightthrust and right turn in the rudder, Two-Bits wound up coming straight in on its nose and made a two point landing on the wheels and bounced 5 feet straight up into the air. The airfoil-shaped fuselage, without a side taper, seems to have increased the glide to a point well beyond expectation. You will find it a tough, rugged little flyer.

Maxi Jr.

(continued from page 40)

length and rub the lube again back and forth into the rubber pores. Now wipe off the excess with a rag, put a drop of oil on the propeller shaft, hang the motor on the plane (knot in the rear), and be ready for a thrilling surprise.

Flying! First check for warps and balance. Warps can be removed by gently twisting the surface in the opposite direction over a steam kettle or the floor furnace; hold for a minute or two, let cool and release.

Now for testing. Hold the plane slightly nose down and give a gentle push. If it stalls (tail heavy) move the wing back slightly and try again, or put a small piece of balsa under the wing. If the model goes straight on down (nose heavy) move the wing forward or place a small piece of balsa under the leading edge or you can remove the wing and move the wing mount forward or backward by removing the pins and replacing them. Once a nice flat glide is established put some turns into the motor.

It is best to have a winder which can be purchased from Sig. It has a 16½-to-1 ratio which means that every time you turn the handle, the rubber will wind 16½ turns. Stretch out the rubber as seen in the pictures and as you near maximum turns walk toward the model until the rubber length is correct to attach to the hook. I squeeze about 80 maximum winder turns into my rubber and the ship climbs almost straight up. But let's start first with only 25 winder turns, (that's about 400 rubber turns). Launch the ship into the wind at about a 45-degree angle. If the model hangs on the propeller and falls back, you need more downthrust.

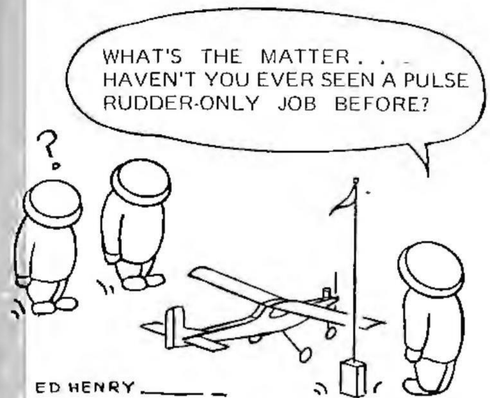
The prop should be removed in this case. Then carve a little balsa off the top and bottom of the nose at a little greater downward angle and put the prop bearing back on and try again. If the plane doesn't climb enough, you need more upthrust and the reverse should be done to obtain this. Once the climb pattern is established, you may bend the nose bearing slightly left or right to obtain a nice right climb. Once the motor runs out, the prop will free wheel (spin) and the ship will begin a left glide turn. Now is the time to permanently cement the nose bearing and the wing mount in position.

Keep increasing the turns each time (25, 40, 60, 80) until you've got a bomb flying. In still air you should average 2-minute flights. When you have thermal conditions (rising bubbles of hot air) you will have greatly increased flight times. Your biggest problem will be to keep from losing your ship in a thermal. We have lost three out of four so far. Do not fly if weather is too windy.

An average flight will see your ship scream into a steep right climb for a few hundred feet or more and then float like a hawk until it reaches the ground. Believe me, I have built many models and ounce for ounce this one has given me more pleasure than any. Don't be afraid to enter this in junior competition. You're a cinch to be a winner!

ANNOUNCING... commander '72

NEW CONCEPT IN PULSE RUDDER-ONLY



For 1972 Ace is proud to announce the Commander '72. Continuing research in the field of pulse proportional rudder-only has produced several significant break throughs. These are incorporated in the Commander '72, resulting in the finest pulse proportional radio system to date.

An improved Drain Brain switching arrangement in the receiver reduces total battery drain which increases flying time from 50-80% per battery charge! Plugs are wired into the airborne unit which allows you to switch the receiver from plane to plane with an absolute minimum of effort! You can have as many different sizes and styles of models as you want with a minimum investment. COMPLETE Flite Pak weights--2.5 to 4.8 oz. The transmitter has increased output to overcome interference.

All of these '72 modifications give you a radio that you truly can be proud of and one that will give you FUN out of this hobby, whether you are a beginner or expert.

–FULLY PROPORTIONAL

Rudder follows directly the movement of your stick.

–VERSATILE

The same receiver and transmitter can be used with airplanes from 18" - 72" wing span.

–INTERCHANGEABLE

Plug-in wiring allows quick switching of receiver from plane to plane.

–LIGHTEST

Weights of 2.5 to 4.8 oz. include Nicad batteries and are COMPLETE weights.

–SIMPLE

Easy installation; actuator has only one moving part. Minimum maintenance.

–INEXPENSIVE

Initial cost of system, airplane, and engine is low; one transmitter and receiver can be used for many different styles and sizes of planes.

–IDEAL FOR THE BEGINNER

–GREAT FOR A FUN OUTFIT FOR THE EXPERIENCED FLYER

COMMANDER '72 R-O SYSTEMS

Completely wired and tested, with transmitter, receiver, actuator, nicad battery airborne pack and charger, switch and connectors. Transmitter battery not furnished.

10G15—Baby System '72	$69.95
10G15T—Baby Twin System '72	$72.95
10G16—Standard System '72	$71.95
10G17—Stomper System '72	$74.95

26.995, 27.045, 27.095, 27.145, 27.195
Please Specify Frequency

TOTAL FLITE PAK WEIGHTS

The Commander '72 units offer the lightest weight practical RC available. Weights given below are the COMPLETE weights, nothing need be added.

Unit	Grams	Ounces
Baby Flite Pak	70	2.5
Baby Twin Flite Pak	76	2.7
Standard Flite Pak	124	4.4
Stomper Flite Pak	135	4.8

'72 RECEIVER ONLY

Superhet with special new Drain Brain output for Adams actuator. Measures only 1 5/16 x 1 3/4 x 9/16". Weight less than 1 oz. Specify frequency.

12K72—Commander '72 Receiver $29.50

ACTUATOR/BATTERY COMBOS

Here is what makes the '72 Commander so versatile. All you need to put in plane for extra installations. With connectors, so you just plug in receiver.

15K15—Baby/225 ma Batt.	$11.95
15K15T—Baby Twin/225 ma Batt.	$14.95
15K16—Standard/500 ma Batt.	$13.95
15K17—Stomper/500 ma Batt.	$16.95

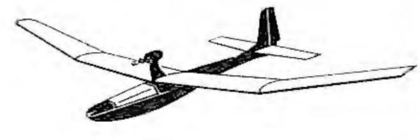
Flite paks, extra chargers, actuators and parts, and batteries available separately.

DICK'S DREAM KIT

Highly Recommended for Beginners

- † 34" Foam Wing--Moulded sections
- † Top grade die-cut wood parts
- † For .020 engines
- † Commander Baby or Baby Twin
- • Owen Kampen design

No. 13L100—Dick's Dream Kit $5.95



ACE HIGH GLIDER KIT

- † 70" Foam Wing -- Moulded sections
- † Precision Machine cut and sanded wood
- † For .049--Power Pod parts supplied
- † Recommended for Rudder-Only Standard or Stomper Commander
- • Owen Kampen design

No. 13L104—Ace High Glider Kit $14.95

2T KIT

The 2T was designed by Ron Jacobsen of Ken's R/C in Shawnee, Kansas. The purposes: An airplane that a beginner could build easily; A relatively large plane using .049 for power, and yet have ample penetrating capabilities under fairly windy conditions; Prove docile in the hands of beginners--and with appropriate adjustments, maneuverable and rewarding in the hands of the expert. The 2T design meets all of these with room to spare!

Uses two sections of the Ace Mini Foam Taper Wings, and one Constant Chord section for a total span of 50 inches, 262 sq. in. Coupled with an .049, the 2T was designed primarily for the two channel Brick type digitals that are on the market, or two servos of any digital system.

Also, when constructed correctly, it performs exceptionally well on Rudder Only using the Commander Standard or Stomper. Motor control can be added to at a later date by using the KRD motor control.

Kit contains three wing panels, all balsa wood completely band sawed and precision sanded, bent landing gear, and miscellaneous parts. Is of the same general high caliber as previous Ace kits. Hardware for hinges and linkage and wheels is left to the buyer.

No. 13L106—2T Foam Wing Airplane Kit 14.75
No. 13L206—Three Foam Wing Sections For 2T 5.00

R-O PULSE HANDBOOK with UP-TO-DATE CATALOG

Only $1.00 (Refundable)

New catalog is completely updated. Includes many items from major manufacturers.

Handbook has expanded data on How Pulse Works, Installation, How to Fly – and much more. Most complete information on Pulse Rudder-Only available anywhere.

Price is $1.00 via THIRD CLASS BULK MAIL. Refundable on first order over $10.00. If you wish faster delivery, add 50¢ for FIRST CLASS.

ACE RADIO CONTROL, INC. • BOX 2001 • HIGGINSVILLE, MO. 64037

NAME
ADDRESS
CITY STATE ZIP

QUANTITY	STOCK #	NAME OF ITEM	PRICE	TOTAL

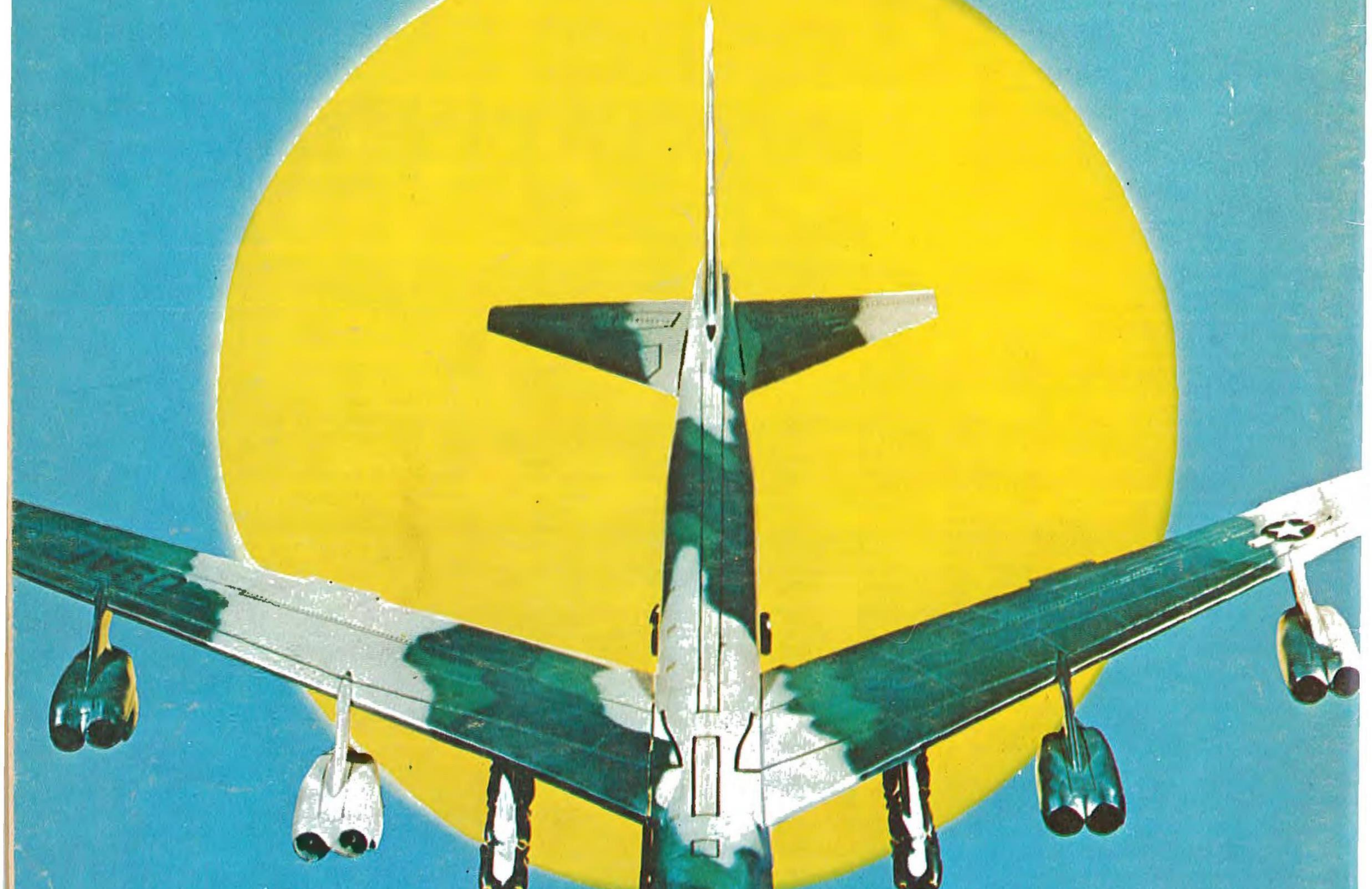
Master Charge or BankAmericard No.

Add $1.00 shipping-handling for direct mailorders except catalog

ACE R/C INC.
HIGGINSVILLE, MO. 64037

MRC

TAMIYA



To avoid confusion with the real thing, we made our B-52 smaller.

The plane flying above is not the real thing. It's MRC/Tamiya's new B-52 Stratofortress with all of its incredible detail and painstakingly precise weaponry. Our very latest in an authentic collection of more than 20 aircraft models which includes the jets, helicopters and vertrols you've been looking for.

This exacting copy of the original captures all the power and excitement of the mighty Stratofort. Originally designed in 1945 for intercontinental, high altitude missions, new versions were made to meet ever-changing defense requirements.

The B-52 can be refueled in flight, giving it unlimited range. Striking power can be either conventional or nuclear. A conventional bomb load of up to 108 bombs can be carried by some models — 24 of the 750 pound varieties on external wing pylons and 84 of the 500 pounders in the bomb bay which provides a total weapons load of 60,000 pounds.

This is the excitement of the Stratofortress — captured by MRC/Tamiya. Get it for your collection now. $9.98.

MODEL RECTIFIER CORPORATION, EDISON, NEW JERSEY 08817